



**Legs et Innovations Durables
des Expositions du 21^e Siècle**
Un Monde en Commun

**Sustainable Innovation and Legacies
in Expos of the 21st Century**
A World in Common

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BULLETIN 2017

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Wings
Benvenuto
Welcome

Preface

Vicente G. Loscertales
*Secretary General
of the Bureau
International des
Expositions (BIE)*

This year's edition of the Bulletin is dedicated to sustainability, a concept that lies at the heart of World Expos. I am grateful to the diverse field of contributors to this Bulletin for sharing with us their combined knowledge, experience and technical know-how, creating a Bulletin that serves both as an analysis of sustainable practices at Expos as much as a guide for city planners and major events organisers. Associating key figures in the organisation of past and future Expos with urban planners and architects, the authors of the following pages are exemplary in imagining, designing and implementing forward-thinking innovations in favour of sustainability and lasting intellectual legacies.

While it may seem paradoxical for “ephemeral” events to be pioneers of long-lasting innovations and legacies, it is precisely the transient nature of Expos that makes them ideal events to create, showcase, and share sustainable practices and solutions. From the planning phase through to the event itself and afterwards, Expos thrive on the power of creation and innovation, with a transformational impact on the host city and further afield. New types of structures, creative techniques, innovative policies and intellectual exchanges all coalesce to create a lasting imprint and wide-ranging echoes. Through Expos, novel sustainable ideas are generated, and key lessons are taught for future generations.

The Bureau International des Expositions (BIE) places high importance on fostering development that meets the needs of the present while enhancing the potential to meet the future needs and aspirations of humankind. This was formally codified in 1994, when the General Assembly of the BIE adopted a resolution on the importance of sustainability, requiring organisers to respect the environment and to integrate the Expo site into the urban fabric of the host city during its planning and management, as well as after the event. This resolution has strengthened the role of Expos as catalysts for change and forward-looking enterprises that reflect not only the concerns of their time, but anticipate challenges and seek solutions for a sustainable future.

Sustainability lies at the heart of Expos in a number of ways. This can first be seen through the concrete innovations in favour of sustainable development objectives that are showcased, tested and put into practice at Expos. At the same time, the intellectual innovations that emerge from Expos serve to foster and drive sustainability on an enduring basis, perpetuating the educational goal of Expos by reaching a global audience. It is the combination of these two aspects of sustainability – as laid out and analysed in the following pages – that reinforces the lasting nature of Expos.

The contributions to this Bulletin offer the reader a broad yet detailed analysis of sustainability being cultivated at Expos through both concrete innovations and intangible legacies. As a starting point, Expos are placed within the context of urban planning, demonstrating where they come from and what drives them. Then, through insightful and demonstrative articles from experts in the field, several case studies highlight creative, practical and shareable innovations born out of Expos in the 21st century, including eco-friendly architectural forms, recycling systems, carbon neutral transport options, and urban greening, among others. As major events that draw millions of visitors and the attention of global leaders, Expos are ripe testing grounds to trial and showcase these creative ideas that serve the future.

The second part of the Bulletin takes the reader on an intellectual journey, offering an overview of the conceptual and intangible ways in which Expos have a lasting impact on their host city and across the world. This process has its basis in the thematic forums organised before and during Expos, gathering international experts to create a turbine for sustainable thinking that continues to produce results many years after the Expo closes its gates. From multilateral agreements to the introduction of new local, national and international development policies and youth engagement, the intangible results of an Expo form a key part of its legacy. These intellectual messages are amplified by the role of Expos as unique platforms for communication and public education that are capable of leaving a long-term impression not only among policymakers and experts, but also in the attitudes and habits of the public at large.

This edition of the Bulletin is therefore an informative illustration of how Expos are unique products of their time and place that address prospects for the future. They are the physical and intellectual expressions of the concerns, the ideas, and the visions of their era, encapsulated within one event, in one city. But their scope and their impact reaches far beyond their duration and the urban environment in which they exist. Expos act as transformational mechanisms that participate in the reconstruction of the global environment by initiating, supporting and propagating change in favour of sustainable progress.

As we look ahead to Expo 2020 Dubai, which will continue the practice of fostering sustainability as highlighted by one of its subthemes, more ideas, more solutions – and more challenges – will emerge. It is the task of Expos, as this Bulletin demonstrates, to capture creative innovations and turn them into actionable and impactful solutions that serve future generations. It is also their goal to bring governments, international organisations, companies, civil society and the wider public together to foster dialogue and lead the way in creating a more sustainable world. In this respect, the BIE will continue to ensure that Expos drive innovation, education and global cooperation in favour of a sustainable future for all.



PART I

Sustainable Innovations at World Expos





Elements of the new urban planning culture. Designing an Expo as key urban strategy*

Joan Busquets

* This article is summarising several hypotheses on "New Urban Challenges in the XXI century" developed during the FRS at GSD Harvard University in 2015-16.

The evolution of the new urban planning culture corresponds to a series of elements which, if studied, can help us understand their innovative value and capacity to become references for urban planning practice today and in the mid-term future. Among them, designing an Expo is getting special value for its potential to enhance urban and economic development.

The following points for reflection must consider new forms of mobility, economy, social justice, links with natural environment and finally, the role of “special events” today.

A. Mobility and sustainable development

Today's cities are dominated by the car. Cars introduced a new logic in the way of designing cities. After the Second World War, priority was given to the private vehicle, one of the new paradigms for the city, consisting of extending ‘modernity’ and producing new ways of life. Public space was orientated towards car use; meanwhile, new extensions became reality through motorways which even crossed and remodelled traditional cities with urban renewal operations.

Low-density residential peripheral areas, particularly in North America, were consolidated as the dominant way of life, while in Europe mixed systems developed, combining low density with large housing estates of tall blocks with large open spaces between them.

But, since the nineties, there has been direct criticism stemming from the great impact of traffic as one of the most decisive producers of environmental pollution, and the appearance of the greenhouse effect, which calls into question Western industrial development as it had previously been conceived. According to UN-Habitat figures for 2011, cities consume 75% of the world's energy and are responsible for 80% of the greenhouse gas (GG), caused by emissions from burning fossil fuels. In this system, the combustion of cars and trucks is crucial.

The Rio and Kyoto protocols of 1992 and 1997 respectively should be highlighted.

This situation, its great impact on what is known as climate change and the serious consequences for the survival of the planet has awakened a very serious debate on the need to rethink forms of mobility to achieve more sustainable means of transport.

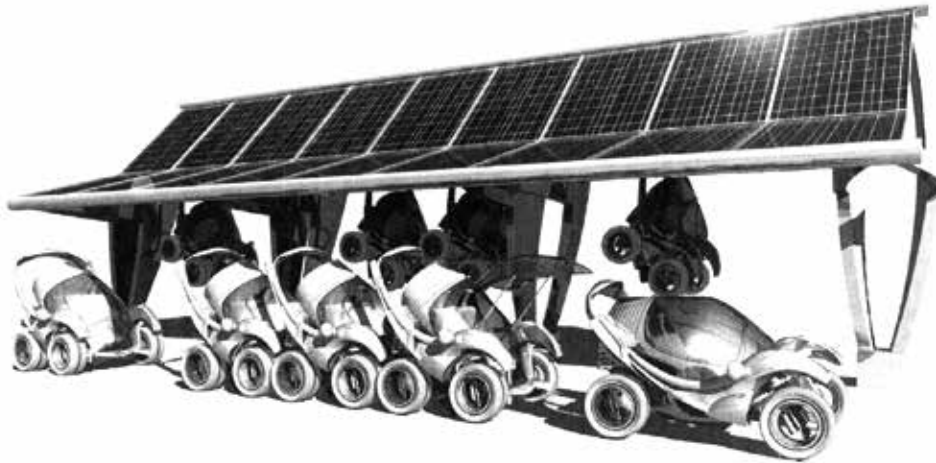
However, technological changes are making cars and other forms of mobility evolve. See, for example, the study “The Car in 2035”, referring to Los Angeles, which presents various options so that the mobility of that great global city can evolve in the medium term. There are other innovative initiatives worth highlighting intended to reduce the need for mobility and to promote shared journeys, such as car sharing or alternative telecommunication systems, among other proposals.

Meanwhile, changes in user habits are extremely important as only by creating a new culture based on more responsible mobility can this conflict so deeply rooted in the ‘city of yesterday’–or rather the city of today– be resolved to construct a better city for the future.

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Technological changes are making cars and other forms of mobility evolve.

These two mobility transformation vectors - technological changes and user habits - could be implemented with new policies and actions with very different rhythms and forms. They can be adapted to different cities according to their own culture and socioeconomic priorities.

In fact, the way of implementing new policies will depend on technological changes and forms of user behaviour. These can form a very dynamic interactive system, which, in each case, will depend on the cultural and social framework of the context: we cannot compare Singapore with Mumbai or Barcelona with Los Angeles.

B. Developing new forms of economy: digital and knowledge based

The dominant industries of the 19th and 20th centuries depended on materials, industry, science and technology. In the period after the industrial revolution, the priority was to respond to immediate problems through the creation of physical infrastructures in the city. Many cities grew and expanded offering more housing, increasing mobility with the construction of transport infrastructures, and open space to control public health.

The industries of the 21st century will increasingly depend on generating knowledge through creativity and innovation. Constructing a creative or innovative city is no longer

Constructing a creative or innovative city is no longer based only on the physical (hard) network, it will also depend on the cultural (soft) network



Tempelhofer Feld (in Berlin), the old airport is now a park and a space for several fairs.

The words creativity and innovation are often used indiscriminately, but they are different. Creativity is a process of divergent thought generating new ideas, while innovation is a convergent process linked to the selection and application of ideas. Creativity is a necessary prior condition for innovation, but innovation is what counts, as it maximises the city's potential.

When the city is creative, it means it has problem-solving strategies. The term creative city was first used by Charles Landry at the end of the eighties in response to the dramatic economic and social changes being experienced at the time during the move from an economy based on production and manufacturing to an economy based on consumption and services. The author maintains that a city needs to implement a culture of creativity in the way it operates and to improve the way all its organisations work. The author stresses the 'software', which is the human dynamic of a place, its connections and relations, as well as the atmosphere.

The Gasometer in Vienna has found new social housing and commercial use.



C. *Fairness and social justice in urban development*

based only on the physical (hard) network, like roads or telecommunications; it will also depend on the cultural (soft) network, with the compilation of knowledge through social interaction. These networks must work together on a global, national, regional and local scale. The new geography of the economy is highly dependent on the connection, grouping and integration of different industrial disciplines and human capital.

It is necessary to distinguish between: "creativity" and "innovation".

In the post-industrial period, urban governance models constructed their legitimacy based on new economic development theories, placing the emphasis on the contribution of the urban knowledge of well-off social groups, such as the creative class or the residential economy. In this way, governance in urban business in the recent post-industrial period was defined by the predominance of strategies aimed at the top end of the market, with which it aspired to change the profile of citizens and attract urban consumers to reactivate knowledge.

At the beginning of the 21st century, the challenge of urban governments is the use of information and communication technologies for the competitive development of their cities in a growing and increasingly interconnected and complex world. Urban policies have been gradually impregnated with an alternative different to the excessively top-down practice which has been carried out by urban enterprise. Cities are overturning the logic of commercial enterprise, placing more value on the information and communication process to stress the wealth and the environmental and cultural qualities of the new developments in community management and participatory logic emerging to support the transition of governance and urban policies. Smart cities are gradually recognising the cultural significance of intelligent communities and identifying their foundational innovation networks and the creative associations that make such a transition intelligent. This process requires institutional and political reforms involving the public in democratic activities to improve urban competitiveness and local prosperity.

Smart cities are gradually recognising the cultural significance of intelligent communities

D. Improving the relationship with the environment

Between the 19th and 20th centuries, most cities in the world underwent a period of rapid industrialisation. Industrial development brought unprecedented accumulated capital and expansion to the city. The green-belt is considered to be a tool in terms of sustainability and ecology with a double mission: controlling the expansion of the city and helping it to improve environmental conditions. At the highest level of industrial cities, London, Paris and Boston for example, took a step towards the ecological city of the future by planning and maintaining green belts around the city.

In the 21st century, there is a new understanding of environmental concerns in urban planning. Urban planners have rediscovered the historical model of mixed use and the compact city as a paradigm for more sustainable urban design. Meanwhile, attention has moved towards the transformation of low carbon settlements. Recompacting the city to theorise sustainability at the urban level along with the new awareness of the importance of urban planning and its relationship with climate change have resulted in a change to the environmental agenda, which now includes issues like public transport, health, poverty, exclusion, public space and the inner city landscape. A great deal of effort is being invested in cities all over the world to develop green infrastructures and restructure the economy towards a future with low CO₂ emissions.



Cheonggyecheon river urban design restored the green and public space in the large Metropolis of Seoul.

E. Competition and cooperation between cities is increasing: Expos as special events

Since the beginning of globalisation, cities have been in a position where the direct competition between them is stronger than before. Nowadays, the attraction of 'knowledge' is an aspiration shared by many cities in the developed world

– they compete for industries, individuals with 'knowledge' and the financial benefits provided by innovation. For this reason, cities work to outdo one another with different methods, such as the adaptation of successful approaches from other cities, strengthening their own brand (branding) and by researching other methods of standing out from the rest.

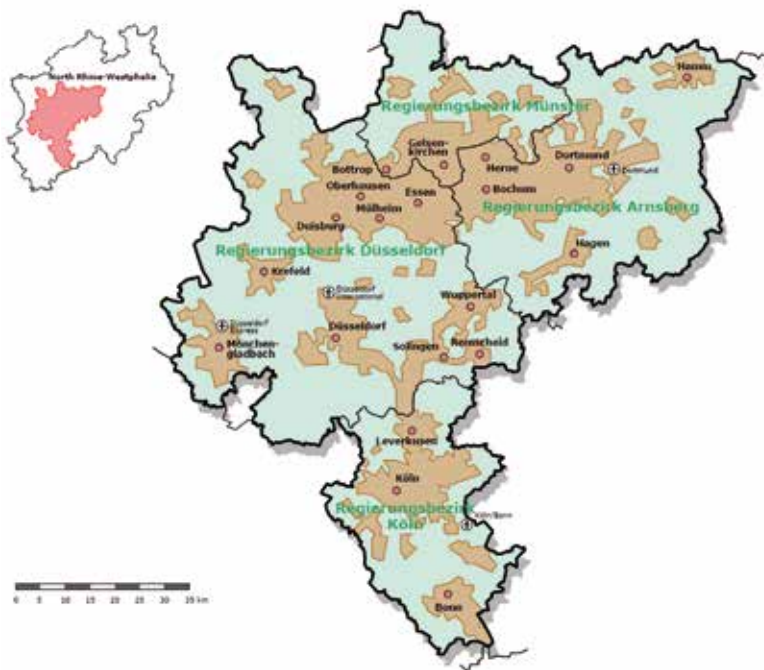
Branding. This is a strategy to provide cities with an image and cultural relevance which, ideally, will work as the source of added symbolic and economic value. A city's brand largely serves to increase its status or prestige as a tourist destination or residential or shopping area. Branding can make people, things and events seem part of the same cohesive discourse. Internal city branding places the emphasis on the public and the internal image of the city. External city

branding focuses on the relationship between the city and the outside world.

The Creative Class. Key group that cities compete to try to attract. The creative class generally consists of groups of people who can generate economic value through their creativity.

Strategies and evolution. The many ways in which cities 'compete' with one another can be divided into two scales or broad categories of work: the regional scale and the city strategy.

Regional scale. Strategic alliances are a way in which cities complement one another while still competing. In the context of globalisation, cities have united as regions to become more competitive, as is the case with the Randstad, in which four Dutch cities (Amsterdam, Rotterdam, The Hague and Utrecht) are grouped into a larger urban agglomeration. There is also the case of the Rhine-Ruhr region, which includes ten big cities and acts as the only megacity in Germany. Recently, Singapore and Hong Kong are joining forces for the Fininvest in the region among many other initiatives.



Rhine-Ruhr region as Regional scale strategic alliances.

Since the beginning of globalisation, cities have been in a position where the direct competition between them is stronger than before

City strategy to improve its ranking. First, architectural treasures are one of the most extreme examples that big cities have insisted on in order to stand out; reference is also made to the Bilbao effect, and it includes a wide range of architecture that can be found in Las Vegas or 42nd Street in Manhattan, as well as museums and complex cultural facilities.

Second, special events: competition between cities to be the venue for ‘special events’ such as Expos, Olympic Games, the World Cup, the Capital of Culture, the European Capital, etc., associated with an increase in tourism and recognition and therefore generating economic growth.

F. Contemporary Expos as “special projects”

In the framework of this experience, a new body of reflection on urban organisation in the form of special projects seemed to emerge. Plans for cities must exist and must be implemented on the basis of thorough knowledge of a given reality and commitment to resolve the specific urban issues of each city and each historical context. However, important actions seem to be based on “special projects” such as Expos or Olympics with the power to integrate the infrastructural contents of each urban part with a more general urban planning vision.

The idea of the special or monographic project had played its part in the past, providing the driving force behind major plans for some cities; examples in the USA include Burnham or Olmsted’s grand proposals for Chicago, San Francisco, Boston or New York, developing Expos or major special projects.

Many metropolitan or large cities undertake a process of urban redevelopment by means of which the traditional city once again becomes the centre for new urban activities and even some forms of residence. While this interpretation highlighted the difficulties of the “deurbanising” process of the seventies and pointed out the consolidation of a major transformation of the economic system with the powerful growth of the service sector, it was important to avoid an excessive determinism, which would make these variables a precedent for an urban dynamic.

This return to the centre was possible due to the existence of many apparent or concealed “opportunities” in numerous cities that were beginning to mobilise themselves. Recent times were the decades of consolidation of new areas of transformation in the existing city:

- a) Old city-centre ports become obsolete due to the increase in ship size, changes in unloading systems and the protagonism of containerisation (the big ports of London, Antwerp and Rotterdam are good examples)
- b) Railway stations, which require a periodic overhaul, normally every 20-25 years, with the addition of new uses (Paris brought a dozen stations up to date in a decade)
- c) The change in hierarchy of stations with the possibilities introduced by the high-speed train, along with the dismantling of large railway spaces, now without a train service
- d) Large industrial sectors that change their main use (such as the well-known Bicocca in Milan, Lingotto in Turin, Billancourt in Paris, and many more)

- e) The development of experimental neighbourhoods with specific programmes, whether residential or service-oriented; for example, the German IBA schemes are a prime reference.

These opportunities however were mostly occupied by the new innovative activities generated or promoted by changes in the economic system. New services, big shopping centres, intelligent offices, representative spaces, well-endowed residence, etc., were the dominant uses in special projects.

But above all these processes are frequently the result of labels that give rise to the special aspect of the operation. For example, the Barcelona Olympic Games, justified work on infrastructure that the city had been needing since the sixties and on opening it up to the sea.

If we consider some Expo examples:

Expo 1992 modernised Seville in the form of the urban development of the island of La Cartuja and the regularisation of the river's passage through the city.

Expo 1998 Lisbon was looking for an excuse to establish its first urban façade over the river Tagus towards the east of the city. The selected site “colonised” the industrial east riverfront, changing the “ecological” direction of the city towards the east. Today, the Expo site is one of the most successful places in town and new large developments will occur nearby by recycling a great deal of other industrial sites

Expo 1998 Lisbon



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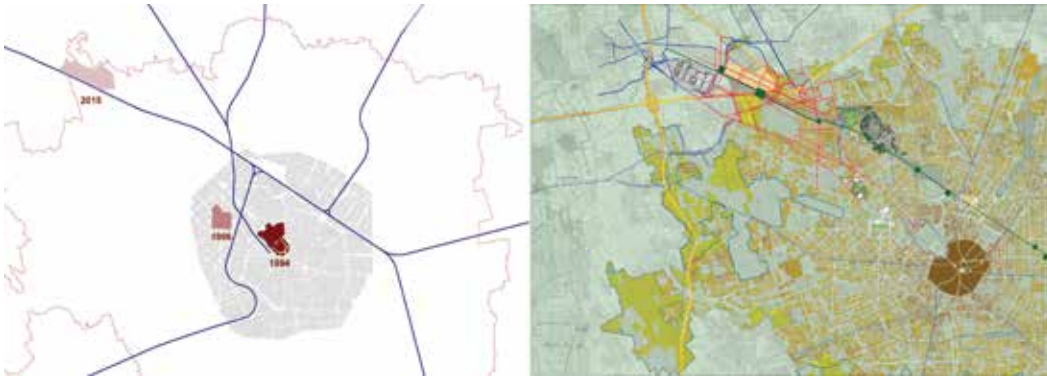
In Shanghai, a large portion of the riverfront was refurbished for Expo 2010. New uses are filling Expo lands and new spin-off are happening on nearby sites; showing the synergic capacity of the “special event” in this large metropolis.

Expo 2010 Shanghai



© JOAN BUSQUETS

At Expo 2015 Milan, a fairly compact site due to the presence of heavy infrastructures can open room for future mixed-uses expansion of Milan towards the north-west.



Expo 2015 Milan

Expo 2017 Astana can enhance the project for the capital of a new country after independence in 1991. The Expo project reinforces the Axial Plan for the new capital, placing the Expo towards the south. This may attract some innovative activity in the short run.



Expo 2017 Astana

The desire to establish a time limit for the operation is plain, and the idea of marketing is part and parcel of its definition: cities seem to be sure that in addition to convincing their citizens, they have to persuade other operators to buy or develop these excellent opportunities.

These general characteristics of “special events” and Expos in particular, have a definitive influence on how the new urban development dynamic of big cities takes place and is managed. Special interest may have to be given to how recent Expo projects can provide experimental proposals for sustainable city that later can be applied in other contexts.

The following aspects should be highlighted:

1. The urban development process no longer follows the pattern of general plan, partial plan, architectural project; instead it comprises schemes and/or projects with executive capacity, which together are capable of setting the city or a large city sector in motion. They therefore have a force of their own, but also a large capacity for induction.

This idea of schemes and central projects had a tradition in urban planning history, though it had been abandoned in favour of more bureaucratic forms that identified urban development as the administrative management of the city, which, though important, should not be regarded as exclusive. These schemes had to be set in the context of a general strategy – a programme or the content of a fully-fledged urban plan – to prevent them being mutually restrictive; otherwise they could limit or even cancel each other out. These experiences were to lead to changes in traditional urban planning and management in keeping with the need for agility and commitment to action.

2. Once again, however, the commitment to the form of the city came to the fore. “Special projects” were used to address difficult, delicate parts of the city, urban rears and abandoned areas, for use as first-rate urban spaces. This gave rise to very sophisticated design strategies and highly committed processes of defining urban form and intervention.

This experience also involved an unprecedented renovation of urban design instruments. The “urban project” was recovered and urban composition was once again a priority. Such an intense renovation of instruments had not been seen since the post-war years, and it was certainly indebted to the methodological and theoretical experience of the seventies, which had sound analytical and critical baggage.

In any case, the integration of various functions, infrastructure and building were plausible endeavours on the part of these special projects that led to the redesign of urban form, overcoming the fatal dualism between infrastructure and architecture that had been instated by a mistaken interpretation of the modern movement.

3. Relations between the public and private sectors in urban development also changed radically. The apparent segregation of interests and competences was smoothed over. Terms such as partnership came right to the fore.
4. The commitment to schemes and projects, and new collaboration agreements between the public and private sectors gave rise to new ways of managing and implementing urban development. The creation of special public and/or mixed bodies was the order of the day. Improved efficiency and the organisation of *ad hoc* task forces were the main benefits.

These structures did however involve the risk of duplicating administrative and/or political missions. It was vital to clearly outline tasks and relations with the institutional or corporate “centre”. It is also necessary to ensure that the general urban and city aims were satisfied by the relevant control mechanisms to avoid management efficiency “justifying” the absolute privatisation of more ambitious social tasks.

In any case, the critical aspects of this special situation have to be explored to enable them to have a far-reaching effect on the renovation of the disciplinary corpus of urban architecture and development, which have stagnated in administrative and bureaucratic backwaters. Only in this way can full advantage be made of what may be a period of contradiction and change, but which has all the potential of new possibilities for positive action of “special projects” in the existing city.

In short, we can optimistically imagine that the door is open to further-reaching reflection about forms of intervention in the city, where Expos are playing a key role on innovative development, and we can be quite sure that this is an interesting way that our cities have a chance of winning the prize for this new dynamic that they so desperately seek.

BIBLIOGRAPHY

A. Mobility and sustainable development

Robin Hicknam and David Banister, *Transport, Climate Change and the City*, 2014. London, Routledge.

Peter Hall and K. Pain, *The Polycentric Metropolis: Learning from Mega-City Regions in Europe*, London, Earthscan.

Nathalie Roseau, *Aerocity. Quand l'avion fait la ville*, Parenthèses, Marseille, 2012.

Kati Rubinyi, *The car in 2035*, Civic Projects, L.A., 2013.

B. Developing new forms of economy: digital and knowledge based

Flew, T. *Creative Industries and Urban Development: Creative Cities in the 21st Century*. Londres: Routledge, 2013.

Florida, R. L. *The Rise of the Creative Class*. Nova York: Basic Books, 2012.

Bianchini, F., I Landry, C. *The Creative City*. Bournes Green: Comedia, 1994.

Katz, B., I Bradley, J. *The Metropolitan Revolution: How Cities and Metros Are Fixing Our Broken Politics and Fragile Economy*. Brookings Institution Press, 2013.

M. E. Porter, 'Clusters and the New Economics of Competitiveness'. *Harvard Business Review*, 76, 1998.

C. Fairness and social justice in urban development

Irazábal, C. *City Making and Urban Governance in the Americas*. Ashgate. 2005.

Ansell C and Gash A. Collaborative Governance in Theory and Practice. *Journal of Public Administration Research and Theory*, 2008. 18: 543-571.

Fischer F. *Reframing Public Policy. Discursive Practice and Deliberative Practices*, Oxford: Oxford University Press, 2003

Townsend, A., *Smart cities: Big Data, Civic Hackers, and the Quest for a New Utopia*. Norton, London, 2013.

Lefebvre, Henri. *The Right to the City*.

Harvey, David. *Rebel Cities: From the Right to the City to the Urban Revolution*.

D. Improving the relationship with the environment

Lehmann, Steffen. *Principles of Green Urbanism*, 2011.

Birch, Eugenie, and Susan Wachter, eds. *Growing greener cities: Urban sustainability in the twenty-first century*. University of Pennsylvania Press, 2008.

Rouse, David C., and Ignacio F. Bunster-Ossa. *Green infrastructure: a landscape approach*. American Planning Association, 2013.

Busquets, Joan., *Deconstruction/ Construction: The Cheonggyecheon Restoration Project in Seoul (Green Prize)*, Harvard GSD, 2011.

E. Competition and cooperation between cities is increasing: Expos as special events

Geenhuizen, M. S. Van., and Peter Nijkamp. *Creative Knowledge Cities*. Northampton (Mass.): E. Elgar, 2012. Print.

Onder Redactie van Urban Affairs et al. *City Branding: Image Building & Building Images*. Rotterdam: NAI, 2002. Print.

Schriefers, Thomas. *World Expo Architecture*. AUMA, Germany, 2014.





Sustainable legacy in the planning

Adrian Smith and Gordon Gill

Sustainable design means different things to different people – ask an engineer what it means and the response will likely include a reference to reducing energy demand, water consumption, material use, waste generation or some other tangible, measurable resource. Ask an urban designer or a community worker and you are more likely to hear words and phrases such as social equity, land use, resilience and healthy community. Ask a local government official and you may hear talk about economic stability and growth or employment opportunities and crime rates.

Sustainability has always transcended the colloquial definitions assigned to it, yet there is somehow a perceived requirement that sustainable design be all things to all people and, indeed, throughout history, the importance of issues that include cultural longevity, education and economics have always been integral to the success and sustenance of any culture.

For Expos, the critical sustainable concept includes many of the above and is most important to be delivered in a legacy concept. This is important to the cultural and economic longevity of the city and the country. In the end, engineering, urban design and architecture need to all combine with the cultural and economic needs of a project. The absence of any of the above can lead to an isolated solution that does not stand the test of time.

Adrian Smith + Gordon Gill Architecture has had the pleasure and distinction of working on two recent Expos: The Astana 2017 Future Energy Expo and the Dubai 2020 World Expo. Each of these have their own unique planning and sustainable demands and characteristics. The distinction is between Specialised Expos such as Astana (where the site is fully developed by the Organiser) and World Expos such as Dubai (where the Expo is defined by the multiplicity of separately designed pavilions). The challenge of the designer in both cases is to implement sustainability throughout the whole site of a Specialised Expo, or to integrate it within the larger Master Plan of a World Expo.

EXPO 2017

SUSTAINABILITY IN THE PLANNING AND MAKING OF A SPECIALISED EXPO

Astana is a relatively new city, established on 10 December 1997 as the capital city of Kazakhstan. Since its formation, the city has exhibited tremendous growth. An increase in population (the 2017 census reported a population of 1,006,574 within the city limits) as well as a strategic geographic location, almost at the centre between Europe and Asia, has allowed Astana to become a global destination for business and commerce. Serving as the cultural gateway to Kazakhstan, the city represents the entire country and its principles. Astana has also been the host of international



Astana Expo 2017 site

events engaging world leaders to discuss issues of international relevance. The Expo is one such event, inviting and engaging people from around the world.

Expo 2017, in Astana, Kazakhstan, was organised around the theme “Future Energy,” a theme that is particularly important as Astana shifts from a primarily oil-based culture to one with diverse natural and sustainable resources. The Expo 2017 theme is aimed at finding ways to achieve qualitative changes in the energy sector, primarily for the development of alternative sources of energy and new ways of transportation. Finding sustainable energy supplies is a critical and growing global concern and solutions to these concerns will ensure economic growth and improved social standards while reducing the burden on the environment. Consequently, “Sustainable Design” was important to this theme.

In order to be successful, the legacy design for Expo 2017 had to consider these issues including an appropriate economic approach to the development. The importance of attracting the world to Astana was certainly crucial for the Expo but attracting commerce and residents in the legacy mode were the most sustainable and economic related concepts under consideration. Designing the project to be an integral part of the city and seeing the Expo site as a home for future residents to live, play, work and learn, was critical. Identifying the trajectory of the local and national culture in order to position Astana on the global stage was equally as important but the transformation from Expo to legacy was the driving principle for the design, execution and delivery of the project.

In order to make the project feasible, a mixed-use approach to programming, which identified needs such as schools and

*Seeing the Expo site as a home
for future residents to live, play,
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housing typologies appropriate for the market, was very important. The energy component of the design expanded these fundamental principles and served as the overriding platform in order to move these principles into the next generation of buildings for the city.

The Astana brief

Adrian Smith + Gordon Gill Architecture (AS+GG) designed the Expo 2017 Master Plan and associated 33 buildings considering the designated theme, “Future Energy,” a concept that is aimed at finding ways to achieve qualitative changes in the energy sector, primarily for the development of alternative sources of energy and transportation.

Finding sustainable energy supplies and a solution to these concerns ensures economic growth and improves social standards while reducing the burden on the environment.

From the start of Expo 2017, it was understood that the project was rich in potential, rich in programme and had a vast array of building types associated with it. It had cultural significance and it was clear that it was a transformational project not just for a city, but for a country. The concept for the Expo - “Future Energy” - aligned well with the legacy approach for the project.

The Expo was visited by 4 million local residents and tourists. With around 85% of the total number of visitors being citizens of Kazakhstan, it was crucial that the community was fully engaged with the buildings. It was important for the team to understand the larger issues surrounding the event and the city and to conceive of the buildings and their related Master Plan as an integrated urban, architectural, social, cultural and sustainable contributor to Astana.

Design approach

The concept for the project was based on the criteria that designing for the legacy mode was as important, if not more important, than the Expo mode. There was an understanding that the Expo would capture the city’s attention for three months, but the economic prioritisation was that the buildings would last for decades. If there was value to invest in the life-cycle legacy of a country and city, then the buildings and Master Plan needed to address the community’s post-Expo functions at least as equal to those for the Expo itself.

Expo City, the post-Expo development, will embrace the Expo 2017’s “Future Energy” concept by becoming one of the world’s most energy efficient communities, where energy consumed by the community will be provided from renewable sources. Buildings will utilise a variety of energy saving and generation concepts in order to provide a low energy-use platform in both Expo and legacy modes. AS+GG’s Expo Master Plan provides the infrastructure to encourage and support the use of an array of networks including using vehicles that use renewable fuels. The forms and language of the buildings are designed to reduce their energy needs and operate as “power plants” that harness energy from the sun and/or wind. The buildings will use this power directly or supply it to the district-wide smart grid for storage or use.

As we continue to deal with growing urban populations and increasing demand on basic resources such as water, food and energy, Expo City will become a model for future cities. It will be a hub of knowledge in renewable energies generation, and distribution, and a laboratory of these technologies that will serve as an example for future generations. The Smart City concepts and technologies introduced in Expo City can be expanded and integrated into the rest of Astana and eventually Kazakhstan.

Site and Master Plan approach

The site

The Expo City project site is located in Astana, Akmola Province, Kazakhstan at a cultural axis, just south of the Bayterek Tower and east of the knowledge/science centre of Nazarbayev University. Because of this distinct and meaningful site, Expo City is positioned to be a significant landmark in Astana.



Although historically the site was a small-scale agricultural development – and prior to that it would have been steppe – no farmland was disrupted and the site was designed within an existing boundary delineated by existing main roads. The site works well as an infill site that completes the southwestern corner of Astana.

Within the general energy theme of the Expo, the overall aim was to reduce the energy demand of the site to the greatest extent possible using both passive and active strategies. At the same time, opportunities for generation of power were investigated and incorporated into the public realm and the building design.

The architecture and Master Plan were designed by using site-specific indicators like solar and wind orientation, weather conditions, and the cultural context, that were determined from a series of studies with the goal of minimising the site's energy-use while maximising its energy-harvesting potential and comfort levels.

The Master Plan

The Master Plan for Expo City was designed around the same guiding principles as the Expo. The resulting analysis offered the most efficient orientation in order to optimise solar radiation to reduce energy usage for heating. Not only does this strategy improve user comfort but it also maximises the potential energy that can be generated from building mounted photovoltaics and wind turbines.

The Master Plan was conceived not as an Expo demonstration project but as a community for the city and its residents. The approach being that the buildings will be designed and built once and transition from Expo to legacy would be minimal. This concept includes systems and platforms for everything from technology and energy to public transportation and public space.

Equally important, are the lasting physical connections that will be developed from the Expo site to existing sites around Astana. For example, a covered city concept has been developed to connect the Nazarbayev University, the future train station, the retail corridor and the Expo buildings. This zone will encourage pedestrian use and connectivity all year round and will include residential, office cultural and retail use. To the north, the linear park which serves as an entrance to Expo, is anchored by the Bayterek tower; toward the south, by the “New Symbol of Astana:” the Kazakhstan Pavilion.

The site-wide infrastructure concept, developed by the AS+GG team, is an integration of occupants, buildings and utilities. These include a smart-energy grid, smart recycled water grid, integrated waste management system, water reduction and waste to landfill reduction targets.

Phased development

Split into two phases, the 174 ha project features exhibition and cultural pavilions (230,000m²), a residential development (1,376,000m²), service areas including shopping, socio-cultural, educational and civic facilities, parks and parking for a total of legacy master planned area of 1,805,000m².

Phase 1 or the “Expo mode,” contains the Expo buildings including the central Kazakhstan Pavilion; Theme, Corporate and International Pavilions; as well as hotel, Congress Center, retail, art and performance spaces. The first phase includes



Nur Alem Sphere,
Expo 2017 Astana

the design and construction of a series of buildings that will act as a “covered city”, which will include retail and office spaces. Phase 1 also includes a series of temporary buildings designed to comply with their Expo function and be efficiently moved to their final destination in Astana or any other desired destination after their Expo use. This group of mostly pre-fab modular buildings include Kiosks, entry canopies, taxi and bus stations and amphitheatre enclosures.

Phase 2 or the “legacy mode,” will integrate and adapt the Expo mode buildings into their final legacy mode. International and theme pavilion buildings will be converted into an office and research park, attracting international companies and entrepreneurs. Expo on grade parking and service zones will be transformed into thriving first class integrated neighbourhoods with an additional 667,000m² residential area, as well as offices, hotels, local markets, and civic and educational facilities.

When considering the Master Plan, for the legacy mode, the design team’s first observation was the potential lack of human scale given the immense scale of the site as well as the required space needed for large crowds. This deficiency in a city with such harsh weather conditions does not promote a sense of place and would not be conducive to a healthy life style of a walking city. The design proposed ways to help the citizens of Astana enjoy a more walkable city with a denser - and healthier - urban environment that promoted community engagement through public spaces and gardens.

Through careful environmental analysis, the Master Plan was designed to significantly reduce winter winds on public

The design proposed ways to help the citizens of Astana enjoy a more walkable city with a denser - and healthier - urban environment

The key to the economic value of the project was the legacy mode

streets in order to enhance and promote walking. Primary and secondary streets were sized to a more comfortable human scale.

Landscapes were designed to make open park areas more comfortable all year long. Building envelopes were shaped to maximise sun radiation on living spaces to reduce energy consumption and to improve indoor spaces all year long. For the harsh winters, connectors were proposed between buildings that promote pedestrian circulation connecting the centre of

the complex for those who study, shop and work so that all can enjoy the array of cultural venues by simply walking through a series of public enhanced spaces.

The key to the economic value of the project was the legacy mode. The Organiser should not have to spend billions of dollars on an Expo that lasted three months when they could create an economic engine for the city that would last a lifetime. Establishing new standards of energy with a neighbourhood that will thrive and improve the way of life in Astana was an integral part of the process.

The Master Plan design effort also included all the periphery housing parcels and their architectural and sustainable guidelines. The process included meeting with housing developers and their architects and discussing the design of buildings and parcels in a sustainable way. In the end, every residential parcel was sold generating a great amount of revenue for the Expo Organiser, thus reducing the need for public funds.

Building design

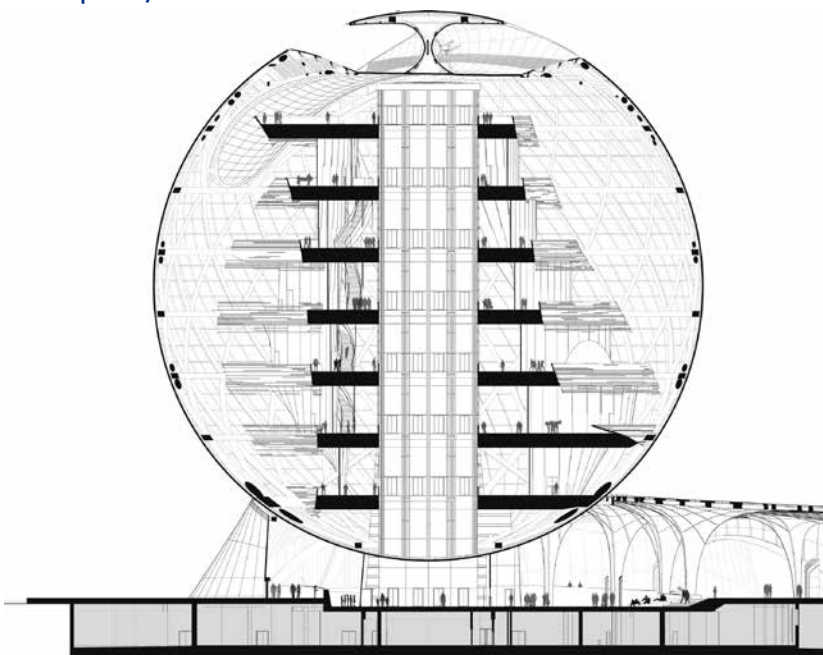
The defining symbol of the Expo 2017 site is Nur Alem – the Kazakhstan Pavilion Sphere (24,000m²) – located at the centre of Expo City. The pavilion consists of an exterior wall system that reduces thermal

loss and interior solar glare. A host of integrated systems, including photovoltaics, both save energy use and increase energy output of the building simultaneously.

The Sphere serves as an example of the extent of analysis and design that all buildings were subjected to for the project. As a driving philosophy to place buildings in their best possible position in terms of needing less energy, the Sphere was clearly a challenge. The host of building designed in concert with the Master Plan, sought to protect themselves from the harsh winters and absorb as much solar energy as they could throughout the year.

This gives each building its own unique signature, directly related to its

Nur Alem Sphere plan,
Expo 2017 Astana





Nur Alem interior,
Expo 2017 Astana

orientation and use. A practice and process referred to internally as Form Follows Performance.

The Sphere is structurally supported by a central double core that is used to organise stairways and support functions such as service elevators and restrooms. A central atrium is surrounded by eight passenger elevators where visitors can experience the building and exhibitions as they travel on glass elevators from the ground level plaza to the top observation and event space. There are two opposing atria that are designed for absorption and convection in order to circulate air from the warm side of the Sphere to the cool side throughout the year. The envelope is a double-curved-glass facade in order to maintain the true spherical character. This critical design feature emphasises the extent to which the team and consultants pursued design excellence in order to create the highest quality of architecture.

The 80-metre-diameter structure is slightly modified from a perfect complete sphere shape in order to achieve renewable-energy goals. The building's form with its potential geometry adjustments was tested and modelled to determine how to minimise energy use, maximise daylighting, control glare, and take advantage of renewable sources with integrated photovoltaics and wind turbines that create energy for the building.

The generation of renewable energy from the central Expo City building, was not only serving a pragmatic need but a symbolic function too. After arriving the top floor of the Sphere, visitors and residents can experience first-hand, renewable energy generation being exposed to wind and sun energy generation. From the very

top of the highest Expo building, renewable energy generation is produced and experienced.

At the base, a covered access plaza organises the entry sequence to the museum floors and also provides additional exhibition space. Visitors can walk under the sphere and see into the interior spaces for alternative vantage points. Levels 2-8 are designated exhibition floors. Level 8, the highest floor, provides a unique opportunity with unmatched views toward the city and close up experience of renewable energy generation technologies (BIPVs and Wind turbines).

The design team used Building Information Modelling (BIM) to explore multiple iterations of the design in a virtual space early in the design process. Each version was analysed for design expression, energy impact, and structural integrity. The Sphere's complex design required close collaboration with the structural and MEP consultants in order for all opportunities for energy generation to be investigated. After the initial form was chosen, more detailed analysis was conducted using Rhino/Grasshopper to further refine the form and to maximise sun exposure for the solar panels. Many concepts were completed and tested to integrate the BIPV panels while balancing the requirements of other critical building components such as MEP, surface area requirements, collision with other architectural elements, maximising wind swept area for the turbines, and the rationalisation the double-curved minimal surface geometry. Ultimately Building Integrated Photo Voltaic cells (BIPV) were installed at the top of the sphere to generate renewable energy for the building. During the testing phase, the energy model predicted 81,056 kWh/yr of electricity or 2.21% of total energy demand.

To take advantage of potential wind energy generation, a concave area was carved out of the building's top for wind turbines. Countless designs were modelled and tested to find an appropriate form that responded to both the programmatic requirements and that also optimised the amount of energy generation. These iterations focused on the wind energy that could be harvested from the surface of the sphere. The design team worked closely with wind engineers to design and test multiple overall building forms and eventually the various shapes of an inlet on the surface of the building.

Predominant southwest winds activate the turbines that were designed specifically for the harsh winter conditions of Astana.

The Kazakhstan Pavilion and Science Museum is an ideal example of universal design. The team knew early in the design process that their roles as architects and planners would go beyond the delivery of the design. The important goal was to design a building that would be a symbol of pride for everyone in the community. It was important to the designers to work toward a higher standard for urban development and architectural design, one that would serve all of the needs of a diverse 21st century community. For instance, the entire building is completely accessible to people with disabilities.

Other highlights within the complex include the Congress Center and Energy Hall theatre, both of which bracket the extremes of public gathering spaces in both Expo and legacy. The Congress Hall will be utilised for formal gatherings, some of which will include political parties and dignitaries, and the Energy Hall was designed for

the experimental pop-up theatre groups who will need a space in Astana to practice and perfect their craft. Understanding the needs for both of these programmes to coexist in harmony within the plan allowed the team to relate them informally in the plan on what was referred to as the Cultural Axis that connects the Theatre to the Kazakhstan Pavilion and then towards the Congress Hall.

Congress Center

The Congress Center's futuristic design features a state-of-the-art 3,000-person auditorium, exhibition spaces, sponsor presentation areas, secure VIP and VVIP areas, associated press rooms, supporting offices, and a dedicated parking garage. The Center was designed to host significant events during the Expo as well as act as a hub for future events in Astana Expo City, the planned legacy development for the Expo.

The design for the Congress Center takes advantage of its national significance, acting as an anchor for the Cultural Axis in the overall Astana Expo City 2017 Master Plan. The building will be fully integrated into a public park with its main entrance oriented towards the Expo site with full views of the science museum. A covered plaza that will have direct access to the adjacent residential neighbourhood will help the efficiency and control of the Congress Center during legacy mode and of smaller community events.

The Congress Center was designed with an optimised form and orientation in order to reduce energy and carbon loads, while incorporating passive design philosophies. Solar radiation analysis was done to determine the optimal location for the rooftop photovoltaic panels. The exterior walls are tilted downward to minimise solar radiation on the walls. The linear horizontal glass lines along the perimeter provide indirect natural sunlight to the main perimeter circulation area leading to the enclosed end public zone which is also fully naturally light. The daylighting analysis



Congress Center,
Expo 2017 Astana



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Energy Hall,
Expo 2017 Astana

helped determine the shape and the size of the atrium skylight and the density of the solar cells integrated on the skylight glass.

Energy Hall

Energy Hall is a 6,500m², 1,000 seat multi-functional proscenium theatre that was designed to be the main indoor performance space for Expo 2017. Energy Hall has significantly contributed to the cultural experience of Astana, both during the Expo and after.

A public area, which frames and encloses the auditorium, the stage, and the technical areas was created between the glass envelope and the theatrical active volume skin of the building. This area becomes an active space that can be used even when the theatre is not open, extending the use of the venue and activating the covered street adjacent to it. The skin of the theatrical space is designed as an active, programmable, and animated membrane that can remain active and animate the “theatre” though the day, night, and when there are no performances.

Energy Hall is a highly-sustainable building. The façade was built with high-performance, triple-glazed glass. Other energy reduction strategies that used in Energy Hall include hyper-insulated radiant floors, a hyper-insulated roof cavity, reclaimed water for toilet flushing, and responsive lighting controls to maximise daylighting.

Additional Expo buildings

Each building for the Expo was formed specifically for its site. Due to extremely harsh winters and limited sun radiation during this period, the buildings demanded that they be oriented to be exposed to as much sun as possible. Once this optimised

orientation was achieved, sun radiation was either enhancing the interior spaces of the different types of buildings or was being harvested through an array of photovoltaic cells to produce energy.

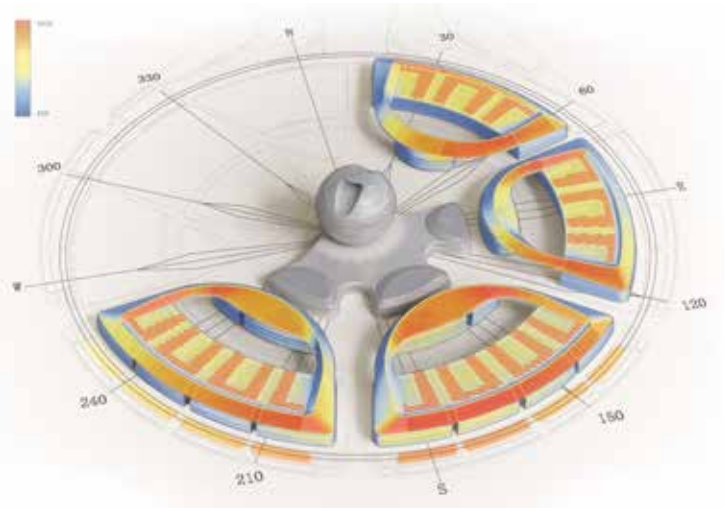
Renewable energy sources power a community where each building has extremely reduced energy demands and also produces its own energy. A state of the art smart grid allows for effective distribution of energy through the day and the seasons.

Each of the Expo buildings was designed to take advantage of their site location. For example, everything in the residential development, from the street grid rotation, the block size and the distribution of building mass was developed through a series of studies to reduce energy use, improve comfort levels (indoors and outdoors) and increase energy harvesting for each unit.

Strategies incorporated into the building's designs include high-performance energy piles that will reduce energy demand and exposed thermal mass that will provide temperature modulation within the buildings during both summer and winter; 100% of rainfall from a 100-year storm event will be managed on site; and 90% of waste generated on-site will be diverted from a landfill.

In the post-Expo phase, the entire district will be transformed into a cultural, office and research park. In studying the fate of previous Expo sites, the design team learned that the approval needed for a legacy development is often difficult and lengthy to obtain from the perspective of the Organiser due to upfront fundraising.

AS+GG worked closely with Astana Expo 2017 NC and the governments in Astana and Kazakhstan to develop buildings that in many instances challenged the established standards, codes, and regulations. Through creativity and compromise, the team was able to successfully procure and implement sustainable buildings that are capable of catalysing a new city development in a totally new way.



Astana Expo 2017 site, radiation diagram

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Design process and challenges: codes and construction

The project required that 33 buildings and approximately 521,000m² of space to be used during the Expo and a total of 597,000m² for legacy mode be designed in a single year. Together the team, along with the local private sector and public agencies, solved the most pressing needs and schedules and influencing new laws.

A key challenge was to design venues that could be easily used and maintained as museums, performing arts halls after the Expo mode or converted into new uses

such as pavilions into office buildings, headquarters facilities, and educational facilities, after the three-month Expo. It was important for the team along with the contractor, to understand the larger issues surrounding international events, such as an integrated architectural, social, cultural, and sustainable contribution to Astana and not just as an island of buildings. Together, the team designed and built a mixed-use neighbourhood that can provide innovative places to live, work, and learn long after the Expo has ended.

The Specialised Expo site can be designed to transition into a permanent development, one that serves the needs of a 21st century community

The team was also able to share their collective previous experiences with the Organiser, heads of state, and other public agencies, insuring that sustainability guidelines and principles of new urbanism were followed. Through patience and compromise the team was able to successfully procure and implement a plan for a sustainable community that is capable of catalysing city development in a totally new way.

The team approached the project focusing on the design of a high-performing and integrated post-Expo community. While the three-month Expo phase was the immediate goal, the valuable lesson learned was that the almost always temporary

Specialised Expo site can be designed to have a legacy – the site can be designed to transition into a permanent development, one that serves the needs of a 21st century community.

Key areas taken into account for this efficient transformation are:

- Expo parking areas (parking on grade for Expo event) are designed to be transformed to residential neighbourhoods.
- Streets, sidewalks, and landscaping were designed and built during the Expo phase in such a way that they are functionally integrated to the post-Expo phase without demolition or reconstruction work.
- Buffer zones were planned around the Expo residential neighbourhoods to create a more intimate and comfortable residential experience with a separation from main roads around the Expo City.
- Renewable generation strategies and infrastructure were included in these buffer public zones to double its benefits.

Astana Expo 2017 site,
post-Expo plan



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- Schools are included in the post-Expo Master Plan to serve the diverse needs of future community.
- All exhibition buildings (with the exception of the Kazakhstan pavilion and retail concessions, which will remain so) will be transformed and integrated into a first-class office complex.

Additional landscape is envisioned for the post-Expo phase in such a way that no major construction or demolition work needs to be executed on the already built Expo site.

Efficient legacy transformation

Expo 2017 Astana closed its gates on 10 September 2017 after 93 days. Post-Expo, the legacy development will be one of the most sustainably built in the world. The design calls for 100% of the post-Expo non-potable water demand to be provided by the on-site water reclamation facility and 24% of the post-Expo electrical demand to be met from on-site BIPV energy systems. As designed, the total post-Expo grid energy demand is 49% less than an ASHRAE 90.1 2010 Baseline, while the office buildings will use 22%-40% less energy than ASHRAE 90.1:2010 Baseline. Overall grid energy reduction is 59%.

Other key areas that add to the efficient legacy transformation include developing Expo parking areas into residential neighbourhoods, integrating exhibition buildings into a first-class office complex, orienting the site for dedicated pedestrian and bike lanes, and creating dozens of public transportation links to the rest of Astana.

This is a moment to transform all thinking related to these project types and to send a global message about community, people and responsibility so as to advance a vision of legacy sustainable thinking.

EXPO 2020

SUSTAINABILITY AT THE HEART OF A WORLD EXPO

Site principles

Unlike in Astana, Expo 2020 Dubai is a World Expo, thus the larger site is a collection of projects being designed by multiple architects and engineers. Continuing the principles and lessons learned from Astana, for World Expo 2020 in Dubai, the team has worked toward similar principles of legacy driven design with very different cultural, environmental and economic values. The legacy approach to the Master Plan has to take into consideration the varying visions and directions that are set by the original Master Plan as well as the disparate design concepts from each team assigned to the various sites.

For Expo 2020 Dubai, legacy guiding principles remain paramount. These principles include issues related to heritage, quality of life, social consciousness, responsibility, economics and timelessness. In addition, design principles including scale,

comfort, climatic comfort, technology and flexible platforms for transit and walkable connections are all considered. Starting with these principles, the team has been working alongside the organising team and continues to constantly test these against the designs and visions of individual projects.

As the design develops, the team has been able to design and test legacy against two scales: the first is the overall Site Master Plan at the district and regional scale and the second is the individual buildings. In addition to the Master Plan legacy work, the AS+CG team is now working on the primary central space and buildings for the Expo defined as the Al Wasl Plaza.

Al Wasl will be the focal point of Expo 2020 and will remain to serve as the legacy park for the district and for Dubai

After the consideration of multiple needs including a major performance space for Expo as well as the legacy need for public space, the design of the next generation of urban development for Dubai was presented as the definition of the heart of the new Expo City. Located in Dubai South, the centre of the Expo, Al Wasl Plaza, is proposed to be a new public space, shaded by an interactive trellis and framed by a series of innovative and sustainable building types.

The economic consideration for the legacy solution was designed taking into consideration site evaluation and creating density where the greatest confluence of pedestrian and transit traffic would occur. By increasing the density of the area, formal public space can be realised and defined as the legacy “gift” to the people of the Expo district as well as the city of Dubai.

In order for this to be compelling, a new prototype for public space was conceived: a green space that can function at an intimate casual scale for families and individuals and then transform into a great entertainment space enhanced through technology for large gatherings or special occasions.

Al Wasl will be the focal point of Expo 2020 and will remain to serve as the legacy park for the district and for Dubai. This great “Urban Room” will be the centre of a community and will comfortably support recreational activities as well as planned events for large and small-scale events. The park will be shaded by a 130-metre diameter trellis structure that will help in providing a cooler microclimate so that users and visitors alike can enjoy the gardens, ride horses and picnic surrounded by lush native landscape and beautiful water features. The space is capable of supporting both individual relaxation in the gardens and major events in the plaza. At night, the space is designed to transform, through state-of-the-art technology, to bring the world’s largest immersive 360-degree visual projection experience to audiences from Dubai, the United Arab Emirates and from around the World.

The space is also designed to provide personal experiences and moments of individual reflection. Its legacy is its flexibility and adaptability which will allow residents to engage in the simple aspects of life that are most meaningful: walking with their children, observing a natural habitat, learning about nature or simply gazing up and appreciating the stars in the desert night sky.

Framed by mixed-use buildings that look onto the park, this active urban community and garden will become a unique and distinguished urban public space. The United Arab Emirates and Dubai are taking the opportunity to make history by



Al Wasl Plaza,
Dubai Expo 2020

creating a prosperous world-class public space as a stage for unprecedented global and local events of all sizes.

The strategies surrounding the teams approach to the design include not only the physical environment but also the social qualities the psychology of comfort and sustainability goals.

Legacy

Following Expo 2020, the site will transition to District 2020, where the work will continue to connect, create and innovate in an urban innovation lab focused on the intersections of business, technology and lifestyle. Over 500,000m² of Expo 2020 buildings, streets and utilities will be repurposed to anchor plots available for 1.75 million square meters of infill development. Creative mixed-use design will enable people to work, live, explore, while fostering creativity, innovation and partnerships.

Strategically located and equidistant between Dubai and Abu Dhabi, directly adjacent to the new Al Maktoum International Airport and Jebel Ali Seaport, District 2020 is at the crossroads of global transportation and business. The Dubai Metro will connect District 2020 and the new airport to millions of commuters each year.

District 2020 will support a workforce of approximately 100,000 people. The Conference and Exhibition Center will connect businesses, products and ideas from

around the globe through international trade fairs, consumer shows and conference events, while attracting more than three million people to the District each year. A variety of work environments will include Corporate Offices on major addressing streets and Creative Offices for small and medium-size enterprises, start-ups and incubators. Research and Development Hubs within the mixed-use areas will include offices, universities, maker-spaces and amenities.

The Emirates leaders' vision to engage with leading science and technologies can be expressed in the use and functions of this exclusively-Dubai public plaza. Science and technology enhance the public use of the space by increasing occupant comfort and offering state of the art public events. Lastly, the Emirates' goal to build for the future and create a legacy that inspires today's children to be tomorrow's great leaders is greatly enhanced by this magnificent public space.

The importance of added value through investment strategies is associated with not only the Expo but the legacy of the District. In all great cities, property values are greatest adjacent to major natural amenities supported by strong programming. Al Wasl will be a magnet for growth and activity in the Expo City. It will serve as a dynamic and memorable public space, attracting a range of businesses, tenants and programmes. An investment in public space is done in order to generate the maximum potential and value for all of the Expo City, Dubai South and Dubai itself.

With this in mind, the design is organised with the following principles to maximise value:

- First, density was redistributed from the perimeter of the Expo Development to the centre where it will be of greater value.
- Second, investment was prioritised within the Expo 2020 from areas that are non-revenue generating structures to structures that are life-cycle revenue generating entities.
- Third, an economic engine is being created at the heart of Expo 2020 that serves the needs during the Expo and also has a strong legacy investment strategy.
- Lastly, public open space is prioritised for the residents and is also proposed to be appropriately distributed throughout the masterplan with Al Wasl as the primary public garden space in which all visitors and residents engage.

Al Wasl marks a moment in time when Dubai is experiencing a cultural focus on authenticity of place. A dichotomy exists between global engagement and the prioritisation of home. In this place, the two become one.

A new typology of urban space, Al Wasl will be the core of this new district and this next-generation public space for the Emirates to share with the world; securing its legacy within the context of the Emirate and forever connected to the event of Expo 2020.

Conclusion

For both Astana Expo 2017 and Dubai World Expo 2020, the approach to sustainable legacy design was and is at the forefront of their delivery. In different ways, the team was able to integrate sustainable guidelines and standards to manage a process

that led to and will hopefully be realised in both projects as a lasting contribution to their respective cities.

In both projects, the creation of new open public amenities and their integration with the existing city has been envisioned as a gift from the city and country leaders to the citizens of their country. Also, the conception of the Expo sites as new centres of growth after the Expo events, was conceived to add value to a city or region, attracting growth and public interest.

To amplify the benefits of a public-private investment was the driver for both projects. Both the private citizen as well as the business environment need to succeed and experience positive results of such national projects.

For both projects, client leadership was critical. Vision matched with policy and execution and ultimately delivery, demands that all aspects of the project team be attuned to the legacy plan. Especially, since the focus can be so driven by the Expo itself.

For future development of projects considering an Expo as a catalyst for their city, the first step in developing the concept might be a genuinely sustainable approach. In both of these cases presented in this article, the projects are new. Perhaps a combination of existing and new buildings that are integrated into the fabric of a city might also be considered. While the Expo projects offer a tremendous amount of excitement and global attention to any host city, it may be that from a legacy standpoint, the betterment of an existing city through sustainable legacy design, may be the greatest legacy Expo plans have to offer.

**Al Wasl Plaza,
Dubai Expo 2020**



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The background image shows a modern architectural interior. A wide, curved staircase with a wooden handrail and glass balustrade leads up from the bottom left. The wall behind the staircase is composed of numerous vertical wooden slats of varying heights, creating a textured, rhythmic pattern. The lighting is warm and directional, casting long shadows and highlighting the textures of the wood.

Sustainable Mega-Events, the Expo “Case Study”: An innovative strategy to sustainability

Gloria Zavatta

Expo 2015 Milan was an extraordinary opportunity for Milan and Italy to host a global event of international importance from an educational, cultural and scientific point of view. The Milan World Expo saw participation from more than 200 participants, including countries, international organisations, institutions, representatives from research, sports, communication, cooperation and civil society.

It was experienced by more than 20 million visitors coming from all over the world, who had the opportunity to take part in a debate on the right to a healthy, secure and sufficient nutrition for the whole planet and sustainable development.

Such themes are associated with the search for more sustainable production and consumption models, a challenge that in 2015 saw the most extraordinary mobilisation around the world: the United Nations adopted the 2030 Agenda for Sustainable Development with its 17 goals and 169 targets that represent the opportunity to identify sustainable development as the main guidance in defining economic, social and environmental policies. The agreement on climate change signed at COP 21 in Paris stated that the important shared commitment to limit global warming increase well below 2°C compared to pre-industrial levels and to drive efforts to limit it to 1.5°C. And finally, in 2015, Pope Francis with his historic “*Laudato si*” encyclical drew the attention of millions of people, worshippers or not, on the environmental challenges of our time and their relation to poverty and social justice.

Even the design, preparation and management of Expo 2015 Milan and its site, represented a unique opportunity for the implementation and diffusion of sustainability criteria, through fundamental commitments:

- Approaching the entire life cycle of the event with many best practice implemented
- Setting challenging goals, which were measurable and communicated to stakeholders
- Engaging all the players and delivering a global message on the importance of each contribution.

The design, preparation and management of Expo 2015 Milan represented a unique opportunity for the implementation and diffusion of sustainability criteria

Expo 2015 Milan had the opportunity to demonstrate that it is possible to organise such a big event in a more sustainable way and its relevant legacy is available on the dissemination book “The Expo We Learned. The legacy of a mega-event in a circular economy perspective.”

But let’s start with the journey of our experience from the beginning.

First of all, the action put in place for Expo 2015 Milan followed the current regional and national legal framework. In particular, the infrastructure plan of the site was subject to thorough verification, aimed at guaranteeing that works and activities were respectful of the resources and the territory concerned.



Expo 2015 Milan

Two specific procedures were adopted: the Strategic Environmental Assessment (SEA) at the municipal level for the change of use of the concerned area from mainly agricultural to mixed; the Environmental Impact Assessment (EIA) at the regional level for infrastructural interventions as well as permanent and temporary construction.

Such procedures brought about a number of provisions affecting all phases of the project life cycle.

The creation of an Expo 2015 Environmental Observatory was also set up with the precise aim of following through the project and periodically verifying that provisions were respected.

Within such frame of reference, Expo 2015 Milan (the Organiser) developed specific initiatives focused on 3 main guidelines:

- Circular economy, from the choice of building materials to the prevention of waste production, from goods reuse to waste recycling
- Management of climate-altering gas emissions, including actions to reduce energy demand, the inventory of emissions and their offsetting
- Certification as an action qualifying element, recognised by independent third parties, with the further objective of communicating the results obtained in a credible and transparent manner.

Sustainability choices were based on a series of management tools, selected and developed considering potential environmental and social impacts within three different dimensions:

- Organisation: processes and activities directly carried out and controlled by the Organiser (eg. the site construction)
- Event: processes and activities emerging from the interaction between the Organiser and participants, partners and suppliers involved at different levels and stages (eg. Food & Beverage services)
- Context: processes and activities within the framework of the Organiser but only indirectly attributable to its action and on which the Organiser did not exert any control or influence (eg. visitors travelling choices).

The following describes the most significant examples and best practices introduced and the results obtained by Expo 2015 Milan.

The Charter of Values

This was a fundamental document to describe the principles followed by the Organiser in fulfilling its mission. Such guiding elements were defined after a constructive debate with stakeholders involved in their different roles in the preparation and implementation of the event.

Sustainability Management System for the event

In order to manage a series of potential environmental, social and economic impacts in a coherent and integrated way, international regulation ISO 20121:2012, event sustainability management systems - requirements with guidance for use (officially issued only in 2013) were adopted. In order to guarantee effectiveness and efficiency action, the management system was:

- integrated with key operations for the development of correct behaviour relating to the awareness and culture of the organisation – this was achieved through close collaboration between different organisational units
- clear, simple and functional, characterised by stripped-down documentation to avoid duplication
- focused on the respect of legislation and on the best performances of significant environmental and social aspects
- based on the involvement of stakeholders.

The Certification of compliance to ISO 20121:2012 international standard was obtained by Expo 2015 Milan for its Event Sustainability Management System first in December 2014, for the preparatory phase, and then in July 2015, for the event phase (DNV GL third-party certification body).

It was the first ever organisation of a World Expo and the second internationally relevant mega-event, after the above-mentioned London 2012 Olympic Games, to develop a formalised and recognisable system of analysis and management of sustainability themes.

Sustainability Reports

As a final commitment, Expo 2015 Milan paid close attention to the communication of the sustainability efforts and results of the event, publishing Sustainability Reports in 2013, 2014 and 2015 with the aim of giving a clear and transparent picture of social, economic and environmental issues related to the organisation of the World Expo. The reports followed the GRI-G4 Guidelines provided by the Global Reporting Initiative, as international references and highlighted the main results obtained regarding the organisation and management of the duration of the Expo up to its closure, focusing on the most relevant activities.

An external verification of the report was not considered appropriate (as recommended by the GRI itself) due to the temporary nature of Expo 2015 Milan and the rapid evolution of the design, construction, planning, event management and dismantling phases did not allow to develop a structured system for collecting data. Nevertheless, performance indicators followed reliable internal collection and verification procedures, under the constant responsibility of the management units in charge of the processes involved.

The Bureau International des Expositions (BIE) made the following comments on the first edition of the Report (2013): “This document contains many valuable data, is to be considered as part of the working process and documentation for the legacy of the event and the report to the Government and Italian authorities. We recommend that you continue elaborating it and further define the potential recipients of this document. It is the result of a great effort and important work that provides valuable information and we wish to acknowledge this.”



France's Pavilion,
Expo 2015 Milan

Carbon management

Expo 2015 Milan undertook the commitment to limit, quantify and offset carbon emissions from the World Expo. In the framework of its sustainability strategy, the Organiser introduced design criteria especially aimed at limiting energy needs. Among the measures to contain emissions, the following can be synthetically enumerated:

- the construction of permanent buildings (Cascina Triulza, Palazzo Italia and Open Air Theatre) based on criteria aiming to improve performances in terms of energy efficiency, and the installation of LED lighting for the outdoors
- the creation of a Digital Smart City on the Expo site by making the most of smart technologies (first and foremost for TLC, electricity distribution and mobility), thus creating an area with high environmental performances – data reported in the Smartainability® study, carried out by RSE_GSE, estimated carbon emissions during Expo 2015 Milan period were lower by 21,000t than with traditional technologies
- the purchase of green electricity entirely obtained from renewable sources with a guaranteed origin to meet the energy needs throughout the entire duration of the Expo
- the implementation of a programme for goods reuse at the end of the event (set-ups, furniture, gadgets, etc.) and for maximising the recycling of building materials and non-reusable goods.

In order to quantify the emissions produced by the preparation of the site and the management of the event, an inventory of emissions following the ISO 14064:2006

standard was created and updated throughout the development of the project from 2012. Inventories for operating years 2012, 2013, 2014 and 2015 and the site dismantling phase were certified by a third-party, who acknowledged their compliance. Expo 2015 Milan was the first mega-event to develop an inventory with a recognised methodology including direct and indirect emissions.

Expo 2015 Milan defined an emission offsetting plan shared with the Italian Ministry for the Environment and implying two types of intervention, which were contributing to local emission reduction projects on the territories of Milan and re-

sorting to the purchase of carbon credits that would be validated, verified and registered according to international best practices.

The purchase of carbon credits was carried out in 2015, for a total of 279,000 credits (offsetting an equivalent number of tCO₂eq) generated by 11 projects certified by recognised standards and chosen according to a reliable carbon offsetting strategy, coherent with the sustainability policy and the themes of Expo 2015 Milan.

Expo 2015 Milan released an international call for tender aimed at the acquisition of carbon credits on the voluntary market – a rather innovative procedure for the

Expo 2015 Milan released an international call for tender aimed at the acquisition of carbon credits on the voluntary market



“The Wings” by Daniel Libeskind, Piazza d’Italia, Expo 2015 Milan

public sector – imposing a strict selection criteria on suppliers to ensure high levels of quality and transparency. A specific framework for the quality of carbon credits to be acquired was created based on transparent and recognised methodologies in order to ensure a real, measured, verified and recorded reduction in carbon emissions by the selected projects.

On top of reducing emissions, the 11 projects entailed several extra benefits to improve life conditions of local populations in several vulnerable countries:

- In Peru, Kenya, Bolivia and Brazil, the projects brought a stop to deforestation (although partially) and safeguarding biodiversity
- In Cambodia, Honduras, Zambia and Uganda, the projects introduced the use of efficient cooking stoves, reducing the use of biomass, with an important impact on the health of consumers
- In Cambodia and Kenya, the projects guaranteed access to drinking water for rural families, and in Turkey they promoted the use of renewable energy instead of fossil fuels.

Pavilions: temporary yet efficient

Expo 2015 Milan created three sets of guidelines for the design phase in order to regulate the construction of the temporary exhibition spaces (pavilions or self-built spaces). These were instructions defining specific environmental requirements and suggesting the sustainability criteria that could be applied according to the different design choices in order to minimise energy and natural resource consumption and to promote the adoption of green criteria in the construction and dismantling phase, with a special focus on the possible reuse of pavilions (or material recycling / disposal).

All the guidelines were published on a shared platform and made available to the participants at the beginning of 2013.

For each phase, the impacts of the most relevant environmental components were taken into account (Table 1) and the relevant sustainability objectives were defined (Table 2). An overview of Milan's microclimate was also provided so that it could be taken into consideration when designing temporary buildings to be used over the period of the event (May-October).

Table 1

Sustainability objectives for temporary buildings at Expo 2015 Milan

Minimising energy demand for cooling
Minimising energy demand for indoor lighting
Maximising energy efficiency
Maximising the use of renewables
Minimising water consumption and waste production
Preventing environmental impacts on soil and air quality
Minimising the heat island effect

Table 2

Main indications (also prescriptive) for temporary buildings at Expo 2015 Milan

Dimensions: building maximum height: 12-17m
Planimetric development in relation to the parcel: minimum 30% as green or open area
Maximum power supply set for each pavilion type in relation to the dimension of the allocated parcel integration of the energy needed with renewable from 242 to about 900kW
Minimum 50% of green roofing
Recycled material use for pavilion construction (foundations included): 50% or more of the overall weight of construction materials
Minimising water consumption and rainwater harvesting for irrigation and sanitary use
Particularly high levels of Solar Reflectance Index (SRI) of roofing and open-air areas in order to contain the 'heat island' effect: SRI > 30% for outdoor areas and SRI > 80% for roofing

Expo 2015 Milan, with the support of the Italian Ministry of the Environment, supported the participants in analysing the project documentation they had prepared, in answering any doubts and in providing all necessary clarifications, helping them attain full compliance with the provisions of Italian law and voluntarily implementing the sustainability criteria.

These led to some significant results, based on the available information:

Efficient cooling to minimise electricity consumption by reducing energy demand through passive solutions.

The air-conditioning of pavilions accounted for a significant share of the energy consumption at Expo 2015 Milan. In order to face such an issue, many pavilions provided for technological solutions to minimise cooling from the design phase. 63 pavilions (as many as 85% of those analysed at the design stage) proposed solutions that would mitigate solar heat gain at the level of the building envelope, introducing, for example, shading and screening devices, ventilated facades, and phase-change materials (PCM). In 48 pavilions (65% of the projects analysed) the solutions proposed involved free cooling or natural ventilation. It is to be mentioned that 5 pavilions minimised the use of mechanical cooling solutions by essentially doing without any air-conditioning system. Another solution adopted by some 30 pavilions (more than 40% of the analysed ones) was green roofing on at least a portion of the building roof – more than 13,000m² of green roofing was done in total. As far as the Solar Reflectance Index (SRI) of roofs and open areas is concerned, 26 pavilions (35% of those analysed) allowed for roofing materials with such SRI values as to reduce the heat island effect. Such values, in accordance with the indications by Expo 2015 Milan, varied according to the accessibility or non-accessibility of the roof to visitors. In the former case, in order to prevent glare, SRI values were equal to 30, and in the latter they were equal to 80. Some other pavilions presented more than 70% green roofing, which could only have positive effects on the heat island control. As for outdoor areas, 17 pavilions provided for the use of materials with SRI equal to 30.

Many pavilions provided for technological solutions to minimise cooling from the design phase

Recycled (or certified) materials for the pavilions: using recycled or certified materials for pavilion construction.

Many pavilions chose wood, and at least 3 declared to have used recycled wood at least for parts of their structures. More than 30 structures, pavilions and clusters employed wood coming from certified and verified supply chains guaranteeing that the material was sourced from forests managed in a fair, responsible and sustainable way. According to the PEFC Italia, almost 32,000m² of wood certified by the association was used for the event.

Energy from renewables, meeting part of the energy demand through the installation of renewable energy sources. Some pavilions installed photovoltaic solar panels for a total of about 2,250m² and a power of around 300 kWp.

Lighting, minimising electricity consumption by reducing energy demand through more efficient electrical systems. As many as 66 pavilions (89% of those analysed)

allowed for the installation of LED lighting systems. Some of these pavilions also implemented occupancy sensors and BMSs (Building Management Systems) to monitor and control lighting systems and other building features so as to reduce consumption. Furthermore, an automatic supervision system for controlling and managing electricity loads was implemented in 14 pavilions.

Water consumption: saving on a precious resource. During an event such as an Expo, water consumption is to be accounted mainly to sanitary uses, installations, catering (for the preparation of meals and crockery washing) and the irrigation system for the green areas. Expo 2015 Milan suggested the implementation of technological solutions to reduce water consumption by up to 50% compared to traditional systems. As many as 55 pavilions (74% of those analysed) allowed for implementing water saving technologies (in particular dual-flush and low-flush toilets). The tanks for the harvesting of rainwater, to be reused for non-food purposes, constituted another important solution for saving on the water needed for installations. One pavilion used the harvested rainwater for the irrigation of the huge sloping green roof covering its exhibition space, and another one installed a tank for water harvesting equipped with a phytopurification system.

Pavilion reuse or recycling materials. Many pavilions were dismantled to be moved and reused elsewhere. For most of them a second life had already been identified at the design stage, and many were conceived for dry assembly in order to be more easily reused. Their new intended uses are very diverse, including a museum, an indoor sporting centre, a restaurant or a botanical garden in the participating country, whilst other pavilions were donated to charities. It is necessary to point out that based on the Life Cycle Assessment of temporary structures, the distance between the first temporary location of the building and its final location is a relevant element in considering its environmental impact. Therefore, if the aim is to reduce the environmental impact of the structures, it is crucial to favour locations which are as close as possible to the original temporary ones and pay special attention to the environmental impact of transport.

Water Houses,
Expo 2015 Milan



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Cascina Triulza,
Expo 2015 Milan

LEED Platinum certification for Cascina Triulza, the symbolic rural building within the Expo site

Cascina Triulza, a late 19th century rural building from the Lombard tradition, originally conceived for the everyday life and activities of farmers, was restored by Expo 2015 Milan based on the sustainability criteria in compliance with the LEED NC (*Leadership in Energy and Environmental Design - New Construction*) standards, obtaining Platinum-level certification, recognised by U.S. GBC, in September 2015. Compared to a traditional building of the same size with standard installations and equipment, it achieved:

- Savings of about 50% in drinking water
- 76% electricity savings
- 70% of the wood used for construction was FSC (Forest Stewardship Council) certified and sourced from sustainably managed forests
- 50% savings on water for sewage
- 64% of electricity needs potentially covered by a photovoltaic system

Cascina Triulza was the perfect meeting point for civil society organisations wishing to be permanently present on the site, and it provided a warm welcome and high-quality services for visitors (mobility, areas for families and children etc.). It was managed by Fondazione Triulza, a network of 63 nationally and internationally renowned non-profit organisations, which created a very broad cultural programme for the duration of Expo 2015 Milan, including 750 events that brought together additional 140 organisations, producers and exhibitors.

Site perimeter,
Expo 2015 Milan



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The construction of the Expo site represented a challenge on sustainability for resource use and impact on the territory. Special attention was paid to the design and actual construction phases, as well as to the identification of innovative measures for compensating the loss of ecological value of the areas undergoing soil use change for the creation of the site. Some significant elements are reported here below.

Greenery

About 20% of the Expo site was covered with vegetation: 250,000m² planted with 12,000 trees, 2,000 of which were fruit trees such as mulberry, apple, plum and apricot trees, 85,000 shrubs, 107,000 aquatic plants and 150,000 herbaceous plants. There were more than 250 different indigenous species overall, safeguarding biodiversity. The project was developed to create a mix of natural and landscaped models, balancing nature and rigour, sustainability and production, function and appearance.

A series of initiatives aimed at recovering pot plants and particularly sensitive ones are currently being carried out.

Water

The canal flowing around the perimeter of the site was part of the 'Vie d'Acqua' (Waterways) project, a series of interventions aimed at enhancing the landscape and environment of open spaces within Milan's western belt, historical springs and the local waterways network.

The canal supplied water (less valuable than drinkable water) for cooling systems, also fed by four double wells for the collection of groundwater and for the irrigation of green areas. Within the site, technological solutions were also adopted – e.g. flow

reducers, diffusors and timers to reduce water consumption, with savings up to 50% compared to traditional systems.

Finally, 11 phytopurification tanks were installed on the site – covering a total area of 9,000m² – to purify first rain surface water.

Ecological value compensation

The urbanisation of the Expo site caused the loss of about 160 equivalent hectares in terms of ecological value. Such loss was offset by a balanced ecological reconstruction programme in the north-west of Milan, featuring the necessary mixture of environmental requalification interventions and ecological improvement in local areas surrounding the site. The Expo Environmental Observatory, set up by the Lombardy region, identified the interventions to be carried out as part of the Environmental Impact Assessment procedure on the basis of 43 proposals submitted by local bodies and actors. Applicants were involved both in the planning and management of the new ecosystems over a period of 20-30 years so as to ensure consolidation throughout the territory.

Electricity and lighting

During the six months of Expo 2015 Milan, 47 GWh of electricity was consumed (EIA estimate was 105), 100% of which was green, derived from renewable energy sources of certified origin.

As for lighting, and in particular external pavilion lighting, highly energy-efficient outdoor LED lights were selected as early as the design phase enabling considerable savings.

Smartness and sustainability

The Smartainability project assessed the sustainability level (environmental, economic, energy and social benefits) of innovative smart technologies implemented by technological partners on the Expo site compared with conventional situations.

The estimated savings compared to a traditional project amounted to:

- 90,000MWh of primary energy from fossil sources
- 21,000t of CO₂, 36t of nitrogen oxides, 62t of sulphur dioxide, and over 5,000kg of particulate matter, of which more than 4,000kg of the fine type
- 6 million euros deriving from reduced material and maintenance costs.

Mobility

A specific focus was put on visitors' mobility, so that they could reach the 4 gates of the site by local public transport: underground, tram and trains, which also stopped at Rho Fiera Expo 2015 Milan station for the whole duration of the event. Official data released by public transport operators highlighted that the majority of visitors (ca. 60%) had a preference for public transport.

It was also possible to reach the site by bicycle, bus or private means of transport and there was a free shuttle service from the nearby car parks.

For on-site transfers, a shuttle bus service (People Mover) with hybrid multi-fuel (petrol and methane) vehicles was put in place.

Logistics

The logistics system of the site was conceived to put together procurement, security and environmental sustainability needs. Over 40,000 vehicles entered the site for deliveries and maintenance, with a means of about 215 vehicles per day and more than 400 in peak days. Some significant elements were that more than 98% of deliveries were carried out during the night, without therefore having any impact on day vehicular traffic, promotion of the use of eco-friendly vehicles (Euro 5 or superior classes, electrical, biofuel powered) and 10% of deliveries were carried out from a nearby warehouse (less than 1km from the site), therefore optimising shipping and load capacity while minimising the environmental impact.

Water houses to reduce waste from bottles

30 public 'water houses' (water dispensing kiosks) were installed at various strategic locations of the site. These kiosks dispensed more than 9.5 million litres of water, significantly contributing to environment improvement insofar as logistics activities and post-consumption packaging management were avoided. The installation of such a widespread network of free public water supply definitely discouraged people from buying bottled water. Nevertheless, it must be mentioned that it was not possible nor appropriate, both for ensuring security and guaranteeing essential services, to prohibit the sale of bottled water in cafes, considering the hot season and the forecasted average of 150,000 visitors per day. It was indeed necessary to guarantee water availability for everybody at any moment in case of overcrowding or temporary unavailability or malfunctioning of some dispensers. Finally, it was necessary to allow visitors with special needs to choose water with specific characteristics, and in this sense Expo 2015 Milan also seized the opportunities offered by sponsorships with producers from the water industry. At the end of the event, the water kiosks were installed in Milan and in some neighbouring municipalities for their second life.

Green Procurement (GP)

Green Procurement may be defined as the process whereby organisations seek to procure goods and services with a reduced environmental impact throughout their whole life cycle when compared to goods and services with the same primary function. Green Public Procurement (GPP) has already been long promoted and encouraged in public procurement-related strategies and policies both at the national and European levels, acknowledging its potential as a key tool to foster a more sustainable use of natural resources and behavioural changes for more sustainable production and consumption.

At the stage of the event's organisation, Expo 2015 Milan's purchasing choices were inspired by green criteria, whenever possible and in compliance with the regulations on public procurement (Table 3). Additionally, a series of initiatives were implemented to disseminate good practices on green procurement as broadly as possible, involving all the main actors – participating countries, partners, sponsors, suppliers etc. – both on a voluntary and contractual basis. The Green Procurement Guidelines played a fundamental role. Drawn up as early as 2013, these guidelines

Table 3 Source: EU GPP Background Reports

GP criteria on food and beverage	GP criteria on furniture
Purchase of organic food	Purchase of legal origin wood sourced from sustainably managed forests
Purchase of food from integrated production agricultural systems	Use of completely or partially recycled materials and renewable resources (wood)
Purchase of fishery products that have been caught or reared in a sustainable way	Absence of harmful substances in the production of materials and in surface coatings
Purchase of animal products coming from breeding farms with high animal health standards	Limits in the content of organic solvents and VOC emissions in products, glues and substances in surface coatings
Purchase of products containing high quantities of recycled materials	Guaranteed easy separation of packaging materials and furnishing parts
Use of multi-use crockery, cutlery and tablecloths	Purchase of furnishings and set-ups that are easy to disassemble, repair and recycle
Use of sustainable paper products	Design oriented to recycling, life-cycle extension and the promotion of green reuse systems (green design)
Selective waste collection and adequate training of operators	Recyclability of employed packaging and preference for the use of recycled packaging
Use of eco-friendly cleaning products for tableware and premises	
Use of low energy consumption electrical equipment	
Use of efficient and low-emission means of transport to support catering services	
Main mitigated environmental impacts	Main mitigated environmental impacts
Eutrophication, acidification and toxic effects on human health and the environment due to bioaccumulation of pesticides and fertilisers from water, air soil and food	Loss of biodiversity, soil erosion and degradation due to non-sustainable management of forests and illegal deforestation
Soil erosion, forest destruction and loss of biodiversity caused by intensive farming systems, aquaculture and fishing	Impact of mining activities on the landscape
Cruelty to animals and disrespect of their health	Use of non-renewable resources like metals or oil/natural gas for plastic
High energy consumption for food production and processing	High levels of water and energy consumption for the production of materials
High water consumption and pollution deriving from food production processing	Use of harmful substances that may be released during the production process, use or disposal of furnishings and set-ups
Packaging waste	Use of organic solvents and production of VOC emissions
Excessive use of cleaning products causing health issues for workers as well as an increase in the pollution levels of waste waters	
High energy consumption caused by kitchen equipment	
Pollutions due to necessary service-related transportation	High quantity of packaging waste

were meant to encourage and guide World Expo participants in the integration of green criteria in their procurement process for all necessary goods and services related to their participation in the event.

Expo 2015 Milan carried out random verifications involving 17% of participants including partners, sponsors and concessionaires. On the whole, the environmental criteria for the category Food & Beverage were the best implemented ones, coherently with the theme of the Expo and showing the specific attention paid by participants to the sustainability of food and catering services on offer.

Recovery of unconsumed food

Expo 2015 Milan, together with a non-governmental organisation, put in place an unconsumed food recovery scheme that saw the involvement of several participants.

After a first pilot phase, involving the gathering of data on surplus at all food outlets and an experimental food recovery scheme with a traditional van, the collec-

*During the six-month event,
almost 50 tonnes of surplus food
was collected*

tion of surplus food entered into force with the installation of a refrigerated container and the use of a cargo bike, facilitating widespread collection for perishable products to be reused within a very short time. More than 25 food outlets became stable donors, and 87 were available to donate any occurring surplus. During the six-month event, almost 50 tonnes of surplus food was collected. With an average value of 2.90 euros/kg, calculated according to the recovered product type, the re-

covered food reached a total economic value of almost 150,000 euros. 14 charities benefited from the project that also represented a best practice in the fight against waste.

Waste management and separate collection

The waste management service on the site was based on the model of the service contract in place with the Municipality of Milan. It included selective waste collection in common areas and in areas pertaining to participants, with the maintaining of decorum during opening hours, both in ordinary conditions and during extraordinary events (eg. Heads of State visits) and the final removal of waste during closing times. Any event organiser could appreciate the complexity of such an event because there was no resident population to repeat messages to in order to lead to progressive consolidation of behaviour, as would have happened in the case of a city. The episodic nature of access to the Expo site of visitors as well as participants from over 138 different countries required facing a universe of actors mostly coming from environments with very different attitudes, legislative and operational traditions concerning waste collection (or, in most extreme cases, completely lacking structured systems for the collection and sorting of waste), which meant they had to learn the principles of selective waste collection only for the day of attendance on site or for the period of presence at the Expo.

Therefore, the organisation of the service guaranteed a timely and thorough action. Indeed, during the six-month period, there were more than 870 reported cases of non-compliance or behaviour anomalies related to waste management by

participants, requiring corrective measures. The latter included over 900 one-to-one meetings with the staff of restaurants and cleaning firms working on the site to recall correct waste sorting procedures, as well as 90 training sessions for miscellaneous staff.

Besides, in accordance with the mission of the World Expo, consisting in the dissemination of knowledge and education on the themes of food and sustainability, a series of communication, awareness-raising and involvement activities for visitors were planned and implemented. Awareness-raising meetings were organised for all volunteers alternating on the site every 15 days. In the framework of their activity of visitor involvement, volunteers were invited to promote correct behaviour and help visitors understand the rules for proper waste sorting. Informative short videos on the importance of selective collection of various types of waste and on the positive environmental effects of selective waste collection activities and of the recovery of packaging and other types of waste were looped on the 44 totems present on the site for 10% of the daily available time. More than 30 benches made of recycled packaging material were placed on site to give a concrete and tangible example of what can be achieved through material recovery and the site featured a temporary installation providing visitors with an interactive tour showing the process undergone by packaging waste – steel, aluminium, paper, wood, glass and plastic – from selective waste collection to the transportation to processing plants and the transformation into secondary raw materials through recycling.

Finally, from mid-September onwards and with the collaboration of two non-profit organisations, an environmental education scheme – Raising Visitors’ Awareness on Selective Waste Collection Services – was implemented, including performances and entertaining initiatives for visitors waiting to get in. The objective was to provide useful information and knowledge on the themes of selective waste collection in place on site.

Expo 2015 Milan’s statement was that it wanted to outdo other similar, major international events by raising the target for selective waste collection to 70%. Although it was a rather challenging goal, given the characteristics of the event, it was in line with the European legislation and policies for the sector, and was considered to be the most advanced scheme for waste management at the global level and hence it was accepted by relevant supervisory authorities. This target was reached



On-site waste management, Expo 2015 Milan

Expo 2015 Milan’s statement was that it wanted to outdo other similar, major international events by raising the target for selective waste collection to 70%

during the last three months of the event, fully compliant with general environmental sustainability principles and with the messages the event itself intended to disseminate, linked to the theme “Feeding the Planet, Energy for Life.”

“Towards a Sustainable Expo” programme

The initiative, promoted by the Italian Ministry of the Environment and Expo 2015 Milan, had the objective to raise further awareness on sustainability needs and to promote greater attention towards voluntary initiatives carried out by participants that contributed to making Expo 2015 Milan a more sustainable event. The programme received the scientific contribution and technical support of two main universities in Milan.

“Towards a Sustainable Expo” fostered a ‘competition’ between participants based on the sustainability initiatives and solutions they adopted, grouped into 4 categories:

- Sustainable architecture (Design & Materials), related to pavilion design
- Sustainable food (Food & Beverage) provided by food outlets and catering services
- The application of green procurement criteria for furniture, packaging, merchandising products and the organisation of events both within and outside the Expo site
- Other initiatives or specific projects on environmental and sustainability themes that could not be classified in the other three categories (e.g. carbon footprint assessment, carbon offsetting, initiatives promoting waste collection, fair trade products etc.).

Decumano, Expo 2015
Milan



On the occasion of the World Expo – which focused precisely on sustainability themes and on the search for food production tools that are more efficient and at the same time more respectful of natural resources – it was important to encourage the commitment of all actors to minimise the environmental impact of their participation in Expo 2015 Milan, while highlighting the most significant sustainable solutions and good practices put in place as a legacy for the future.

80 candidatures from the four categories were received for an overall participation of 39 actors (23 countries and 16 partners and civil society organisations).

In order to give visibility to the programme, two events were organised within the Expo Site. The first was the launch of the initiative, held on 5 June 2015 on the occasion of World Environment Day, while the second one, on 1 October 2015, was the final ceremony to award leaders. The events were attended by Gian Luca Galletti - Minister for the Environment, Giuseppe Sala - Commissioner for Expo 2015 Milan, Achim Steiner - UNEP Executive Director and Jan Dusik - Director of UNEP Regional Office for Europe.

Concluding, mega-events are definitively an extraordinary challenge for host countries and Expo 2015 Milan developed, implemented and measured sustainable strategies and some best practices, obtaining recognised results. It was the first World Expo to be certified for its sustainability management system (ISO 20121), for its CO₂ inventory (ISO 14064) and offsetting 100% of its CO₂ emissions (carbon neutral), and finally the first one that issued sustainability reports. Indeed, Expo 2015 Milan went beyond the event and left a legacy of ideas and initiatives for future events.

Sustainability Reports 2013, 2014, 2015

<http://www.expo2015.org/archive/it/cos-e/sostenibilita/il-rapporto-di-sostenibilita-di-expo.html>

List of suppliers and actors supporting the sustainable initiatives implemented by Expo

2015: AzzeroCO₂; AMSA - Gruppo A2A; Amicucci Formazione; Bureau Veritas; CAP Holding; Certiquality; CONAI; DNV GL; Business Assurance Italia; Ecoact S.a.S; ER Creativi in prima linea; Ernst&Young Financial Business Advisor; FLA - Fondazione Lombardia per l'Ambiente; Fondazione Bancoalimentare; Fondazione Building Green Futures; Giulio Patrizi Designer; Icmq; Industria Scenica Cooperativa Sociale; Legambiente Lombardia; Manens-Tifs; Metropolitana Milanese; MWH; Greenwich; RSE - Gruppo GSE; SAPM - Scuola Agraria del Parco di Monza; TREE; IEFE - Università Bocconi; Politecnico of Milan.





A photograph of a modern, multi-level building with glass railings and a yellow and blue train on an elevated track. The building has a blue facade and large glass windows. The train is yellow and blue, with a white stripe. The sky is clear blue. The text is overlaid on the upper half of the image.

Transport modes of people and goods at Expo 2005 Aichi, Japan and their features

Toshio Nakamura

Expo 2005 Aichi was an epoch-making Expo in the sense that it presented a range of possibilities to address a social agenda through innovative exhibits, events, operations and all other aspects. Expo 2005 Aichi showed us bright prospects of how technologies, social transformation and people's behavioural change, driven by enhanced awareness, could make a difference to our lives. It, indeed, became a showcase of innovative solutions in line with the goals of the Bureau International des Expositions (BIE).

Efficient, safe and eco-friendly transportation of people and goods have become increasingly important these days. In this context, Expo 2005 Aichi made innovative efforts as well.

As the organiser of Expo 2005 Aichi, I will discuss these efforts taken by the Expo in terms of technologies, social systems and people's awareness and behaviour in this order.

Technological aspects

LINIMO: introduction of HSST (High Speed Surface Transport)

A magnetic-levitated linear motor car, commonly called "LINIMO", was built to carry visitors for the 8.9km journey from Fujigaoka Subway Station to JR Expo Yakusa Station. LINIMO was the first commercially operated Maglev train service in Japan and played a pivotal role in transporting visitors for the Expo. Initially developed

Magnetic-levitated
linear motor car,
Expo 2005 Aichi



by Japan Airlines Co., LINIMO ran 8mm above the track with a maximum speed of 100km per hour. It was an excellent mode of transport, especially in an urban area, as it could run with less vibrations and noise. Although LINIMO was designed to serve as mere transit mode, it gained huge popularity as a future vehicle or mobile pavilion. I recall my own experience of moving a floating Maglev train with three of my fingers. LINIMO was a three-car train system that used normal conduction magnets for its driving force and could accommodate 244 passengers. Thus, one of the major challenges of LINIMO was to fill the huge capacity gap between LINIMO and other transports such as the subway or the Japanese Railways.

Although LINIMO was designed to serve as mere transit mode, it gained huge popularity as a mobile pavilion

Superconducting Maglev

Visitors could see real-world superconducting linear motor cars exhibited in the Central Japan Railway Company's Superconducting Maglev Pavilion. At the 3D Superconducting Linear Motor Car Theatre, visitors were able to experience the approximately 500km/h speed of a linear motor car hurtling on the Yamanashi Maglev Test Line and feel the very moment of its levitation. It became a widely popular attraction. The basic principle of its levitation and propulsion was to make a superconducting state of practically zero electric resistance by cooling liquid helium to -269°C . In April 2017, it attained the world record for the highest speed of 603km/h. Construction of the "Linear Chuo Shinkansen line" that adopts the Maglev technology is now underway by JR-Central to connect Tokyo to Nagoya (285.6km), with the goal of starting operations in 2027. The exhibit will herald practical applications in the near future and raised the hopes of visitors for the future. Undoubtedly, it had a great impact on achieving a practical application.



Central Japan
Railway Company's
Superconducting
Maglev Pavilion,
Expo 2005 Aichi

IMTS (Intelligent Multimode Transit System)

For transportation within the site, Expo 2005 Aichi adopted a new intelligent multimode transit system to combine the advantages of both automotive cruise control technology and a rail operation maintenance system. A driverless three-car train system ran in a disconnected convoy for the entire 1.6km route. IMTS had distinctive features, allowing both manual (manned) driving and unmanned driving, in addition to its flexible route-setting ability to select exclusive lanes and other open roads. It was exactly the embryonic phase of what is now called "self-driving" or "autonomous" system. Therefore, unsurprisingly, we had to undergo a continual trial and



Intelligence
Multimode Transit
System at Expo 2005
Aichi

transportation mode, as they use liquid hydrogen for their fuel and only emit water. In those days, they were quite innovative, although fuel cell vehicles had arrived on the market in Japan. We brought in nine FCBs to transport one million visitors. Alongside, we built hydrogen-fuelling stations to supply liquid hydrogen for the buses. Of course, we could have considered regular bus transport as an option. However, the introduction of FCB caught the attention of visitors. It made them feel how wonderful future transport could be and deepened their understanding before it became a familiar technology. We adopted two passenger-car type Fuel Cell Vehicles to serve lead cars for dignitaries on national days.

error process. For instance, a problem arose where an unmanned car crossed with another manned car. The reason for this was that the unmanned driving car was unable to recognise the manned car unless the latter's driver made an exact stop at any designated location. In such a case, the unmanned car was forced to make an unnecessary stop. The problem demonstrated how difficult it is for human drivers to make a precise stop at exact place. The technical glitch required a considerable number days to fix and caused some service outage window. However, the transit system became so popular that the total passenger count reached 1.8 million during the Expo. Morizo and Kiccoro, the official mascot characters, acted as drivers for unmanned train cars, and contributed to its popularity. It was also an event that helped visitors realise the potential of future technologies.

Fuel Cell Hybrid Shuttle Bus (FCB) between two Expo sites

As the Expo took place in two separate venues (Nagakute and Seto, Aichi, Japan), the best way to transport visitors between them was a significant challenge. In order to cope with this issue, a 1120 metre-long gondola was set up. Still, transportation capacity fell short significantly. Therefore, we decided to introduce Fuel Cell Hybrid Buses to fill the gap. FCBs are an extremely clean

Support for the movement of the disabled and the elderly

It is extremely important to provide support for disabled people and the elderly to allow them to move around easily, because it helps enhance their social participation. To this end, Expo 2005 Aichi developed a system to direct disabled people to their destinations and conducted demonstration experiments. It was an integrated system that combined multiple functions including a global positioning system (GPS) to identify one's destination, a frequency modulation (FM) wave function to identify the location of intersections or entrances of buildings etc., an infrared ray (IR) radiation system and an IC tag system to recognise exact directions of objects in the surrounding area. The system was embedded in Braille blocks and other points to indicate where they were at a given place.

We were able to make numerous findings through the experiment. I believe that the demonstration of such forthcoming technologies will heighten the significance of the Expo. Nevertheless, it might have been rather demanding for the general public to figure out what was going on in such experiments.

The efficient management of diverse transportation systems was integral to improving customer satisfaction

Social systems

Expo 2005 Aichi attracted 22.05 million visitors. Transporting such a great number of people in a smooth manner is of critical importance at all Expos. This is especially true for when mass transportation systems are insufficient. Thus, it was necessary for us to channel visitors into different transit modes including LINIMO, subway, JR, bus and private vehicles, as mentioned. In addition, our concern was a big capacity gap between LINIMO and subway/JR. This had the potential to lead to bottlenecks and cause traffic congestion. Moreover, to address insufficient parking space near the venues, we introduced the “park-and-ride” system. We established six car parks and shuttle buses to connect each car park with the Expo sites. The shortest ride to the site was about 15 minutes and the longest was 35 minutes. At any rate, the key to a smooth transit was distribution. In other words, decentralisation of multi-modal transit between rail (subway and JR) and other mass transport systems (buses and private vehicles, etc.) was an overriding issue, besides the allotment among six car parks. The tally of visitors who used the most distant 35 minute-car park exceeded our estimate significantly. The reason for this was that more and more people preferred to ride shuttle bus from a convenient car park rather than the nearest one in an attempt to avoid traffic jams. The result showed how many visitors could make wise choices.

Distribution between multiple transport systems

It was at Nagoya Station where visitors were concentrated the most and made their choices among different transit modes. Hence, we offered a range of information to help visitors make the right decision.

Firstly, a large screen panel was prepared to telecast real-time congestion at the subway/LINIMO transit station. It brought about a huge impact, because many

visitors were able to choose JR or bus instead of the subway after watching the telecast.

Secondly, we broadcast traffic information on a regular basis on the FM radio station that was launched exclusively for the Expo. As the head of the organising body, I also served as the director of the FM station.

Thirdly, we offered exclusive bus services in order to mitigate congested traffic at the transit station.

In this manner, we were successful in transporting crowds of people by way of complementary methods of distribution and bus services.

Introduction of the ITS (Intelligent Transport System) Centre

Even in the park-and-ride system, it was essential to convey road traffic information or car park vacancy information in a timely fashion in order to help visitors make the

right decision. To serve this purpose, we provided such information on specific websites and the Expo's exclusive FM radio, in addition to indicative road signs.

All data including the status of traffic jams at car parks and the transit station as well as the situation of road nodes like the confluence of a highway and general road were gathered at the Intelligent Transport System Centre, or the ITS Centre. Such information became available in real-time on the video monitor and I could see the situation of key locations anytime in my office. I can vividly recall



Intelligent Transport System Centre, Expo 2005 Aichi

that I sometimes provided instructions based on those data.

In the park-and-ride system, a key to the success of smooth transportation was to secure an optimal number of shuttle buses and allocate them in an earlier stage based on proper forecasts.

While it is important to learn from experiences in forecasting such data, it is also essential to be aware of different social backgrounds of the past and the present and so forth. For example, it may be necessary to pay attention to the economy leaning towards the service industry, the demographic situation and business days of local companies. Another finding was that the number of online reservations adopted for some pavilions in Expo 2005 Aichi showed a strong correlation with visitors numbers that day. It indicated that family members or friends found it difficult to change their schedules once they were fixed and that a large number of people came to see the Expo even when they could not make prior reservations. The newfound correlation significantly contributed to our optimal allocation of shuttle buses.

As noted above, I realised that the efficient management of diverse transportation systems was integral to improving customer satisfaction. It was also necessary to smoothly operate the Expo. Moreover, I found it important to establish a flexible social system and a mechanism to influence human behaviour in a positive way in order to ensure safe and fluid human movement.

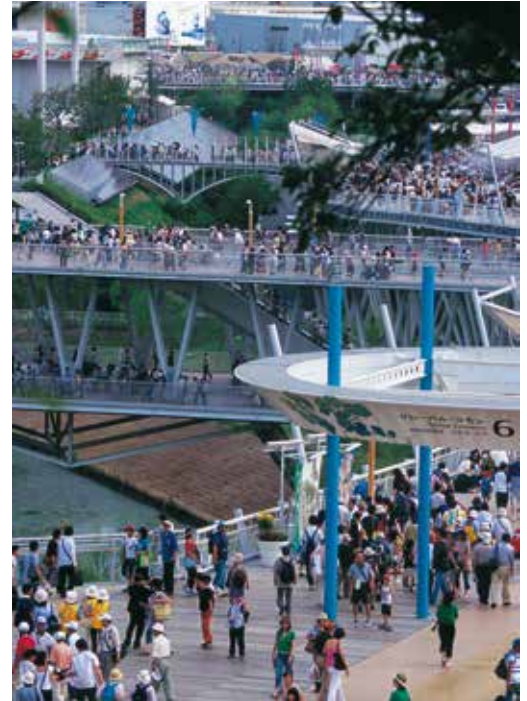
Global Loop

It was imperative for Expo 2005 Aichi to protect the environment. In the construction of the site, land reconstruction and altering the existing topography needed to be minimised to conserve the natural environment.

There was a roughly 40-metre altitude gap in the site. To address the height gap, a “Global Loop” was created – the elevated Cosmopolitan Promenade. Global Loop was the main corridor that encircled the Nagakute Expo site, with an outer length of 2.6km and a width of 21 metres.

“The corridor in the sky” contributed to reducing not only the environmental load but also visitors’ load by enabling barrier-free flow of movement in a site facing a difference in elevation. It worked well from the perspective of landscaping, as visitors could easily find their destinations. Therefore, the Global Loop became one of the main features of the Expo 2005 Aichi.

In this way, it was very important to facilitate the movement of people and goods for the management of the Expo site. The construction of Global Loop also enabled the traffic flow of people and goods to be divided and brought a positive impact on the management of the Expo as well.



Global Loop,
Expo 2005 Aichi

Conclusion

The movement of people and goods can be examined from various points.

First is the technological aspect. That is a matter of how we can improve efficiency, safety and convenience through technology. Expo 2005 Aichi introduced a variety of innovative transport modes, which became main attractions.

The second point is that it is possible to link multiple transit modes to offer the best solution in a comprehensive manner. We made numerous efforts for that.

Third, foot traffic, or human movement on foot, should also be recognised as a crucial mode of transport. Expo 2005 Aichi attempted to facilitate movement for all pedestrians, including the disabled and the elderly alike.

Ensuring the safety, convenience and efficiency of people’s movement will bring a more efficient society, abate social loads and enhance social participation of people. All of them are indispensable components for further social progress.

One should also remember that it is important to encourage people to act properly by exerting influence on their consciousness or mindset.

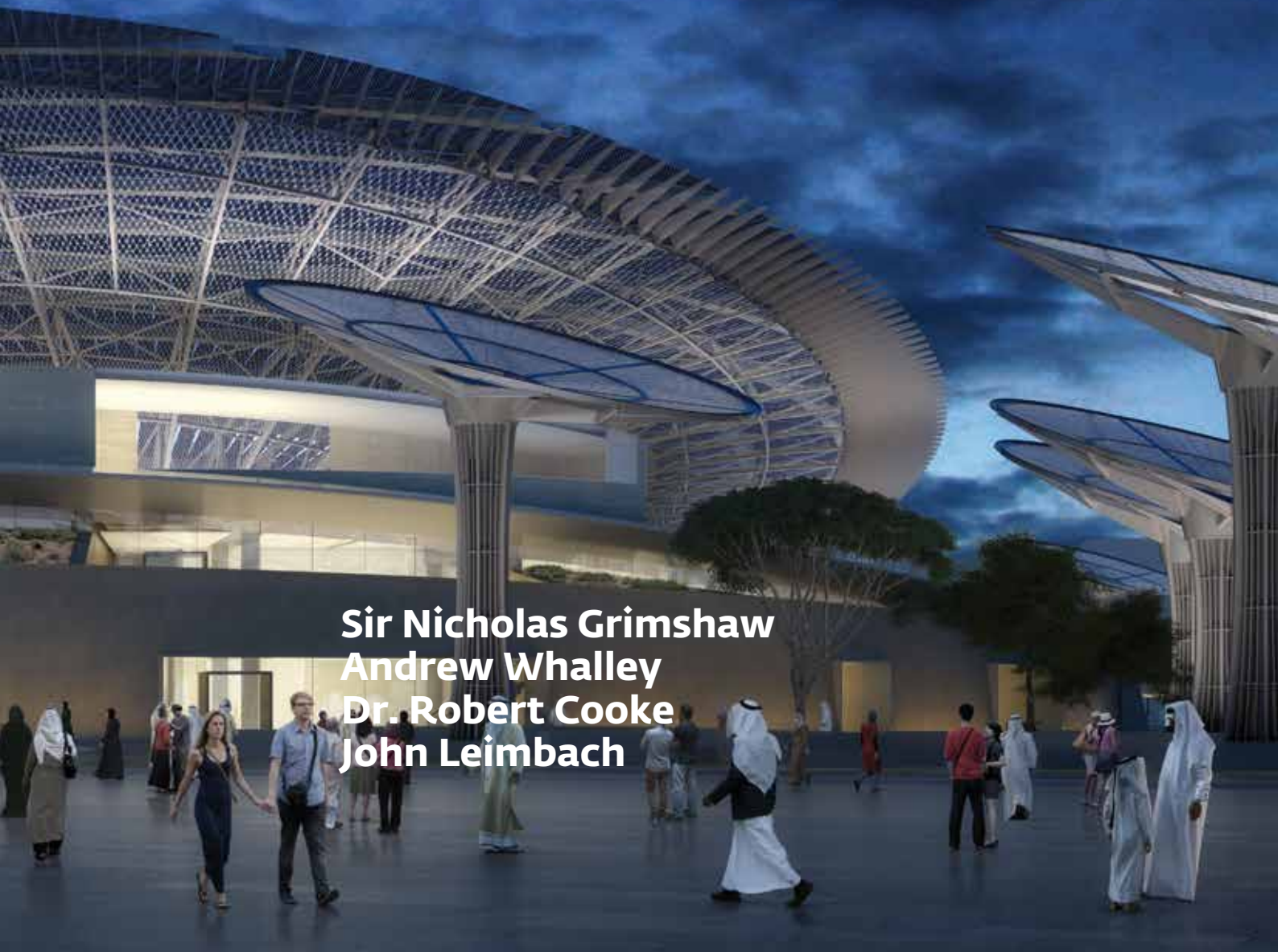
The themes of Expos may change over time and they may be diverse. Yet, transport to the Expo site and the movement inside the site will always follow. Thus, smooth transport of people and goods must be a priority matter of consideration for all Expos, at all times.

*Foot traffic should also
be recognised as a crucial mode
of transport*



Expo 2020 Dubai's Sustainability Pavilion

**Sir Nicholas Grimshaw
Andrew Whalley
Dr. Robert Cooke
John Leimbach**



Sir Nicholas Grimshaw *Chairman, Grimshaw*
Andrew Whalley *Deputy Chairman, Grimshaw*
Dr. Robert Cooke *Associate Director, BuroHappold*
John Leimbach *Research Manager, Grimshaw*

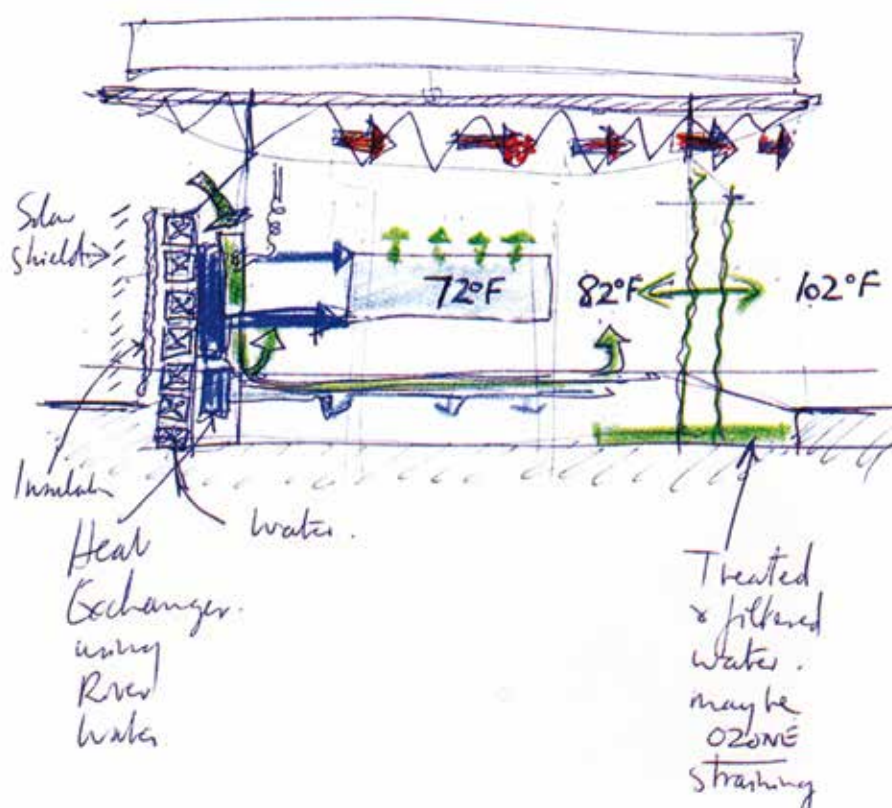
Introduction: A Look Back

Sir Nicholas Grimshaw

Our pursuit, and subsequent thinking about the Sustainability Pavilion for Expo 2020 Dubai brings me back to our British Pavilion at Expo 1992 in Seville. That national pavilion was procured in a similar competition fashion, and it was with similarly enormous excitement and celebration that we undertook the project. The competition concept was entirely based on a response to the climate in Seville, widely regarded as Spain's hottest city. We thought that we should recognise that people had been living there quite happily for centuries without the huge expense of cooling systems and air-conditioning. We resolved to find out how they had managed.

We quickly saw that the massive masonry walls of the older buildings played an important part in modifying the huge variation in temperature from night time to day time. We also saw that air movement was carefully contrived by having large doorways leading into small courtyards so that cool air from the narrow, shaded streets was drawn up through the courtyard and out of the open top. A third factor was the use of water – not just the apparent cooling effect of a small fountain in each courtyard surrounded by plants and ferns, but also the psychological effect of having running water.

A concept sketch by Sir Nicholas Grimshaw illustrates his original vision for the British Pavilion at Expo 1992 Seville as a moderator of climate.



The aim for our design was to try to make life bearable for the visitors to Expo 1992, which was held at the hottest time of the year. However, we also wanted to do this with modern materials and, most importantly, using the minimum amount of energy. We wished to explore a new and emerging architecture language that was shaped by performative systems and a drive to a more sustainable future.

Now, 25 years later, we find ourselves facing similar challenges and mounting familiar aspirations as we develop the designs for the Sustainability Pavilion in Dubai. Amidst comparably challenging climate conditions, we have sought to design a forward-thinking building that's both responsive to and representative of the culture and climate in which it will function. It is with great personal pride and excitement that I look forward to this next milestone in creativity advances towards completion, reviving some of our best thinking, infused with the latest knowledge and technology we have.

*We have sought to design
a forward-thinking building
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and climate in which
it will function*

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Top Left: The water wall on the British Pavilion's east side was a major cooling element.

Bottom Left: Cooling of the British Pavilion's south elevation was achieved with external shading devices.

Right: Visitors to the British Pavilion enter via a ramp that ascends along the water wall façade where water cascades into a pool below.

Sir Nicholas Grimshaw
Andrew Whalley
Dr. Robert Cooke
John Leimbach

Looking Forward to 2020

Andrew Whalley, with contributions from Dr. Robert Cooke and John Leimbach

In October 2020, Dubai and the United Arab Emirates will be on the global stage under the gaze of the international media as the World Expo opens to great acclaim. At the heart of the Expo, the Sustainability Pavilion is an ambitious and innovative centrepiece whose design and contents will captivate the world. The pavilion is an opportunity for Dubai and the United Arab Emirates to lead a new approach to sustainability and conservation, showcasing interesting and innovative methodologies of adapting to ecology and climate while promoting long-term solutions for society. As Dubai has emerged as a hub for global exchange as well as a city of wonders, the Expo and the Sustainability Pavilion offer an unparalleled opportunity to add depth and dimension to the city by firmly establishing a stance on leadership for sustainability and planetary stewardship. Not only will the pavilion debut with great fanfare to fascinate and enlighten millions of Expo visitors from across the globe, it will also live on as an internationally recognised institution. This will extend the pavilion's reach beyond just a visitor's destination to include exhibition and research facilities where science and the public intersect, simultaneously illuminating the wonders of our fragile planet and the potential that our future earth holds.

Grimshaw has developed a design and programme for the pavilion that we believe to be inventive, pointed in its mission and, above all, inspiring. We have sought to achieve this through a quantum leap in thinking, designing a first-of-its-kind demonstration building that is completely self-sustaining and capable of generating its own power and water supply. What we strive for – and what is conspicuous in our best work – is the moment a brilliant idea emerges that will drive the identity of a good project to somewhere extraordinary, challenging and completely unique. This dedication to exploration and innovation has allowed us to develop memorable temporary and permanent fixtures for cultural organisations and bespoke events of international significance across the globe. The vision we have realised for the Sustainability Pavilion is representative of the ingenuity and innovation we have harnessed amongst our design team in pursuit of a Sustainability Pavilion for Expo 2020 that will inspire wonder and delight, capture the imagination and offer the promise of possibility.

The issues we are addressing in our pavilion design are those that are challenges affecting the world on a global scale. While we seek to highlight strategies and opportunities relative to Dubai's native landscape and climate, it is important to note that populations are facing similar issues the world over. By incorporating high levels of new technology that are inspiring, diversifiable, highly recyclable and reasonable to maintain, we will be raising awareness about the environmental problems we face in this century and inspire people with solutions that can efficiently address them on a multigenerational timescale.

To present and illuminate the issues at hand, through both innovative architectural design and the provision of timely and

The issues we are addressing in our pavilion design are those that are challenges affecting the world on a global scale

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The entry to the Sustainability Pavilion reveals its iconic presence, dominated by the central shading structure and animated by a series of “energy trees” depicted in the foreground.



Left: A closer view of the pavilion reveals rammed earth walls and the delicate structure of the pavilion that holds aloft a state-of-the-art solar energy capture system. Right: Winding pathways lead into and around the Sustainability Pavilion through a landscape derived from local vegetation and climate-appropriate flora.

effective exhibition content, Grimshaw has assembled both a design team, underpinned by the engineering expertise of BuroHappold, as well as an Advisory Group Committee composed of some of the brightest and most ingenious minds practicing in fields directly relevant to sustainable development and environmental conservation. This committee, derived from some of the world's leading research institutions including NASA, the California Academy of Sciences and Eden Project, has ensured that the pavilion design and its content are absolutely at the cutting edge of thinking and accurate in their interpretations and assertions.

The central design thrust for the pavilion is to become an exemplar of sustainable design informing, inspiring and empowering visitors to make effective change in their lifestyles as well as becoming generally more aware of the still unfolding interdependence of the global, regional and local ecological systems (including micro-biological systems within us) upon which we depend, support, and are ourselves enmeshed. More than a static experience, the pavilion will retain, and even elevate, its relevance long past opening day. The ultimate goal is a lasting standard-bearer for

Sir Nicholas Grimshaw
Andrew Whalley
Dr. Robert Cooke
John Leimbach

The central courtyard of the pavilion is arranged around the central structure, offering multiple levels from which to view the pavilion's architecture as well as providing access to the pavilion's exhibits.



sustainable living, sitting in harmony with the environmental context that frames it. However, to merely sustain is perhaps to tread water; the Sustainability Pavilion has greater ambitions. To ensure lasting relevance, the pavilion, its occupants, and its natural context must thrive.

Expo 2020 will bring the world together to envision an optimistic and sustainable future. At the heart of that vision, the pavilion will not only educate and delight visitors but also serve as a demonstration building and living landmark to sustainability. Sustainability is not just an aspiration of the project, but implicit in its design and content. Every aspect of the pavilion is being built from the ground up with sustainability as the guiding principle. The esteemed Advisory Group Committee served to holistically define that principle from a diverse range of approaches and fields. With such high aspirations to integrate sustainability throughout the design to deliver positive environmental, social and human benefits, a clear and coherent sustainability strategy has been implemented which provides a clear set of goals and path forward. At the centre of this strategy is a sustainability framework through which the detailed and advanced knowledge of specialists can be integrated to deliver the vision. The framework has provided a transparent means for those engaged with the project to understand the various goals and targets, how they have been defined and ultimately the strategies developed to achieve these.

The building aims to be a net zero energy and water consumer throughout its lifetime of operation while minimising material environmental impacts from construction. The building also aims to act as a living laboratory that will inspire visitors to live more sustainably.

Energy will be generated through the highest specification photovoltaic panels available arranged on a large roof canopy and atop a series of “energy trees” in the landscape. The panels are carefully placed at the best possible angle to maximise

output. The roof canopy pattern follows principles of nature to maximise the area of solar panels and allow automated panel cleaning systems to be deployed. The 18 bespoke energy trees will also be placed around the building to provide shade in external spaces and will track the path of the sun to generate as much power as possible.

Energy will be saved by burying much of the occupied spaces below the ground and providing thick, insulated walls with minimal glazing. Simultaneously, the solar roof acts as a giant shade to reduce the sun's heating effect. Energy usage will be carefully controlled through intelligent systems that sense occupancy and adjust lighting, display screens and ventilation requirements appropriately.

Water will be generated from all available sources on site including the humid air, salty ground water extracted from near the surface and recycled water. These techniques are combined with water saving measures ensuring that water demand is 80% less than a typical building and the remaining water demand is provided from on-site sources. The water system includes plans to create unique dew-harvesting water trees, passive sunlight water disinfection systems, and natural reed-bed water filtration techniques. We are working with major research universities to develop a new approach to the generation of water using innovative, metal-organic framework chemicals that can capture moisture from the air, entirely powered by the sun. These environmental strategies will lend legitimacy and notoriety to the research institute that will live on in the pavilion's legacy mode.

A critical component to the pavilion beyond its outward architectural expression is its content, an element responsible for creating the visitor experience and a primary driver in our design thinking. Following on the exterior architecture that is finely tuned to local circumstances, the exhibition programme we have developed leverages the incredible biodiversity of the region and the striking ways in which nature has adapted to harsh climates and challenging conditions. The United Arab Emirates is a rich source of natural inspiration, bringing together a range of ecologies and opportunities. Both precious biodiversity and a wide range of landscapes and coastal habitats are expansive sources of inspiration and nature's ingenuity. Efficiencies and strategies for survival developed by plants and animals can often be emulated in pursuit of architecture that is both responsive and at home in its environment while educating guests on the incredible ways in which nature meets the challenges of the natural environment.

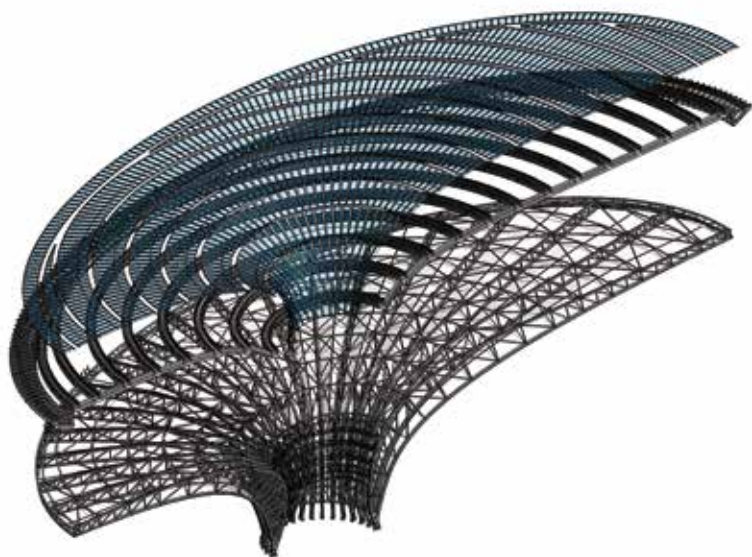
The pavilion has been developed in a holistic approach that includes its

Energy will be saved by burying much of the occupied spaces below the ground and providing thick, insulated walls with minimal glazing

Gabion walls frame an entry passage to the pavilion leading visitors to the exhibitions within.



Sir Nicholas Grimshaw
Andrew Whalley
Dr. Robert Cooke
John Leimbach



An exploded axonometric drawing of the roof canopy structure and photovoltaic array.

immediate landscape and landscaping treatments. The gardens surrounding our pavilion design are an integral part of the visitor experience, both experiential and functional, setting the stage for the exhibition contents within and creating gathering areas that will manage and distribute crowds while providing retail, food and beverage opportunities. Sited in a prominent location, the pavilion structure works in tandem with the considered landscape of demonstration gardens, winding pathways and shaded enclaves to create an aura of magic punctuated by the sights, smells and tactile opportunities of nature. In the legacy mode, the gardens will remain critical to a project of international notoriety

and importance, extending the ethos and mission of the institution inside to the immediate surrounds, properly establishing the stage for an institution of import and innovation.

That the pavilion is designed to perpetuate beyond the life of the Expo is, in and of itself, a sustainable strategy. Longevity is critical to the sustainability of architecture, reducing the usage of resources over time and imbuing a sense of adaptability that allows for future flexibility and purposeful reprogramming. This also presents a challenge, as any time a structure is erected for one purpose followed by a transition to another, a careful balance between cost and value must be sought. As Expo 2020 Dubai endeavors to establish itself as a cultural leader not only during the tenure of the event but over the life of the Sustainability Pavilion architecture, it is important to be represented by design that is both functional and revelatory, utilising technology and inventive design to deliver a distinct architectural presence driven by the message it intends to convey.

Grimshaw is thrilled to be participating in Expo 2020 Dubai and to have the opportunity to deliver innovative and exciting architecture underpinned by a message of hope and potential for the future. We look forward to seeing the building realised, and joining the world in celebration in Dubai.

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PART II

Intangible and Sustainable Legacies





Sowing the seed for change

**Dubai will deliver an Expo
that integrates sustainable
principles not only in its
design and operations
but also in the experiences,
impact and legacy.**

H.E. Reem Al Hashimy

There is no greater priority at this time than cultivating a more sustainable way of living to ensure viability of our natural resources for future generations. It is a mission of universal importance; a priority for Dubai, the UAE, our region and the entire world.

Humanity no longer influences only local environments in limited ways; our impact on the Earth's systems can indeed rival the powers of nature. Our economic and technological success as a species, however, is now tipping the balance between what humanity currently consumes, and what the Earth can naturally supply and absorb.

That is why now is a critical time to address the issue of sustainability, and is the impetus for Expo 2020 Dubai's decision to choose sustainability as one of its sub-themes.

Expo 2020 will be an unprecedented opportunity to bring together innovators, entrepreneurs and policymakers from hundreds of nations for six months to help address the many challenges of living in balance with our environment, nurturing the critical bonds that connect a prosperous society, a healthy economy and a thriving planet.

At the time of Expo 2020, the Sustainable Development Goals (SDGs) will have been at the top of the global agenda for five years, and the Expo will be held in a location where, historically, survival has always depended on managing limited resources and preserving biodiversity.

The UAE Government has made sustainability a priority in its national strategy and is actively championing it in areas such as energy, water, food security, green buildings, biodiversity and conservation, and, importantly, education and innovation.

The environment of the UAE and the rapid development and urbanisation of the country brings lessons and challenges that can inform our priorities for sustainable development, including in education, awareness and lifestyle.

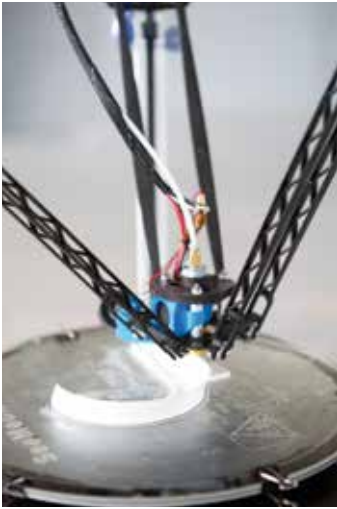
We intend to take these lessons to Expo 2020, while providing an international platform to share best practices and develop new ideas.

Expo 2020's contribution to sustainability

Dubai will deliver an Expo that integrates sustainable principles not only in its design and operations but also in the experiences, impact and legacy.

It will focus on creating inspirational narratives through exhibitions and events that we hope will convey the message that while the world is indeed facing sometimes seemingly insurmountable challenges, we live at a particularly important time, where we have the knowledge, technology and, increasingly, the will to find new solutions to live in harmony with our environment.

Through the convening power of Expo 2020, we also aim to support the UAE national sustainability strategy, while giving all participants a platform to showcase



their own initiatives and achievements in the area of sustainability. The global event will provide a platform to connect minds to share ideas and best practices, and find creative solutions to these key concerns, not only of the UAE but of the majority of cities and communities around the world.

Expo 2020 will demonstrate that the foundation for sustainability is the values that we have embraced for our organisational culture: humility, excellence, collaboration, respect and integrity. Expo 2020 will leverage those values to integrate sustainability into our own actions, including how we collaborate with our partners, what we expect from our suppliers, and how we create the Expo 2020 experience.

We hope to also shape a new narrative for sustainability. One that is hopeful, exciting and inspirational. One that demonstrates the opportunities available in addressing our current and future challenges.

How Expo 2020 will deliver its commitment to sustainability

Expo 2020 Dubai aims to address the issue of sustainability in a multi-facet approach that is inclusive of the global population and inspires a new era of living in harmony with our planet. This legacy will cover not only physical measures but also the impact of connections to the economy, businesses, youth, innovators and society.

Sustainability is no longer a luxury, or an extra drawcard. It is the new baseline. Similarly, it is no longer purely a reference to preserving the environment. The sustainability of a World Expo now naturally encompasses a wide gamut of intangibles, from its enduring economic and social impact to its ability to instil new values and inspiration in visitors, particularly youth, which are both real and virtual.

The Expo site will act as a reference point to shape dialogue and education around sustainability, while also inspiring youth to take up this important mission and carry forward our progress.

Dubai will deliver an Expo that integrates sustainable principles not only in its design and operations but also in the experiences, impact and legacy

This concept of ensuring that the Expo leaves an enduring legacy – physically, economically, socially and in reputation – has been at the heart of planning since Dubai won the right to host Expo 2020. We believe a sustainable Expo will be one that continues to reap benefits for the foreseeable future, acting as a catalyst and potentially compounding the results experienced during the six-month global destination. It will be simply a seed from which a new, more sustainable era may flourish.

Expo 2020's physical sustainability targets



Sustainability
Pavilion,
Expo 2020 Dubai

Expo 2020 will lead by example. It will not only be the Sustainability Pavilion that pushes the limits of sustainable practice and technology; the entire site is being designed and constructed with the most sustainable technology, materials and operational practices. All permanent buildings will achieve LEED Gold certification as a minimum and will be connected to smart infrastructure that we will use to monitor and manage water and energy use, as well as carbon emissions.

Bringing together a combination of passive and active solutions enhanced by innovation and technology, the Expo site, and particularly the Sustainability Pavilion, will be a demonstration in both operations and exhibitions of the synergy between traditional and new

solutions, between historical approaches and emerging best practices.

The pavilion will strongly focus on minimising water waste and maximising efficient water usage and recycling. A series of iconic and innovative 'water trees' will demonstrate how water can be harvested from humidity in a process inspired by photosynthesis. These features remind us that the UAE's resilience was built on a profound understanding of our environment and how to coexist with it.

We have committed to a number of targets, including:

- Supplying 50% of the site's energy requirements through renewable energy.
- Achieving a 40% reduction in drinkable water usage in buildings, with all water for irrigation and cooling to be from recycled sources.
- Segregating at least 85% of Expo's waste at source to enable more efficient recycling and to reduce waste to landfill.
- Adhering to stringent air quality standards and a transport strategy that facilitates low-emission modes of transport, including a direct Dubai Metro line and the ExpoRider public bus service.



Bird's eye view rendering of District 2020, the legacy of Expo 2020 Dubai

A legacy of sustainable infrastructure

In the legacy phase, 80% of Expo's buildings will be repurposed as part of District 2020, including the Thematic Districts. The Sustainability Pavilion, for example, will become a Children and Science Center that will continue our efforts to engage and inspire young people to become responsible custodians of our planet and to imagine the next generation of sustainable solutions.

In other words, the site, in Dubai South, has been designed with a future city in mind and Expo 2020 is a key destination in its long-term journey. One of the best connected locations for companies and residents alike, District 2020 will be an interdependent community that will be an integral part of the legacy of Expo 2020 Dubai beyond 2021.

District 2020 is envisaged as an environmentally progressive and sustainable place to live and work, setting new benchmarks for the urban experience. It will be home to iconic structures and spaces such as the Al Wasl Plaza at its heart, as well as the Theme Pavilions and the falcon-shaped UAE Pavilion, which have been designed by some of the world's most renowned architects.

District 2020 will also maintain the Expo's commitment to empowering children and youth by generating interest and benefit through social and cultural attractions, including the Children and Science Center.

A conference and exhibition centre is also being developed by Dubai World Trade Center to be the next step in Dubai's evolution as the Middle East's premier destination for major events, conferences and exhibitions, continuing on Expo 2020's legacy of connecting minds to solve global challenges.

District 2020 will benefit from this incredible facility and the thousands of connections that will be made as visitors

District 2020 is envisaged as an environmentally progressive and sustainable place to live and work, setting new benchmarks for the urban experience

from around the region – and the world – come together to share ideas and create opportunities.

District 2020 has been deliberately designed to facilitate collaboration, between innovators, SMEs and corporations alike. Supporting the acceleration of the UAE's development, District 2020 will be a long-term economic contributor for the country as a home for innovators, original thinkers, and pioneers. This is where you could see the next big idea become a reality from 2021.

Connecting minds to solve problems worth solving

Expo 2020 is bringing together more than 200 countries, international organisations, businesses and NGOs, and we anticipate 70% of the 25 million expected visits to be from people outside the UAE, the highest proportion in the history of World Expos. We intend for Expo 2020 to be the most globally inclusive and diverse Expo, creating an extraordinary opportunity to help address the many challenges around sustainability. But, more importantly, the connections will be built to last and the outcomes of such connections will generate creative solutions to this pressing global challenge.

As suggested by Expo 2020's theme, "Connecting Minds, Creating the Future", connections are imperative to ensuring our Expo is sustainable. Whether it is two innovators sharing ideas that produce the next great invention or a start-up in Africa forging a relationship with an established firm from Europe that allows it to upscale and enter international markets, Expo 2020 will be designed to encourage and facilitate such connections, physically and virtually.

We are already doing this through our series of business events and programmes, which aim to not only engage businesses with Expo and its opportunities but also to connect them to Expo's partners and to each other, building ties that will remain well beyond 2020.

Expo 2020 is also creating deep and meaningful collaborations with its Premier Partners, seven of which have so far been announced from an eventual target of 12.

Highlighting the economic opportunity in sustainability

Preserving the planet is not only about cutting back and Expo 2020 aims to uncover the potential, particularly economic, in addressing challenges around sustainability. This will be a key component of the new narrative we will write on sustainability.

We aim to find, develop and showcase sustainable solutions that are scalable, demonstrating that creative ideas can come from anyone, anywhere, extending benefits to the wider UAE economy, as well as the region and the world. We are already doing this through our flagship programme Expo Live (see below).

Expo 2020 is expected to generate many thousands of direct and indirect jobs, with the economic reverberations felt in housing, tourism, education, healthcare, retail and entertainment, among other sectors. In addition, more than 50% of Expo 2020 contracts so far have been awarded to SMEs, helping them to upscale and build their businesses for the future.

*We aim to find, develop and
showcase sustainable solutions
that are scalable*

But through the procurement process, we are challenging our supply chain to move beyond 'business as usual' to higher levels of environmental awareness and stewardship. This will not only inspire businesses to redevelop their products and services to be more in harmony with our natural resources but also demonstrate that doing so can be profitable.

Expo 2020 is also a significant trunk for the UAE Government's vision to diversify towards a knowledge-based and environmentally-friendly economy. It is acting as a catalyst for sustainability efforts in Dubai and the UAE as they strive to meet ambitious and internationally-leading targets for renewable energy and environmentally-friendly practices.

The strategy for the Expo and its legacy also will set new ground for the country going forward, deliberately targeting the strategic sectors identified by the government as being key to its economic future. They are logistics and transport, travel and tourism, construction and real estate, and education – all of which will be infused with a new sustainability ethos.

Expo Live

The UAE has announced its intention to be a global leader in innovation and Expo 2020's flagship social impact programme, Expo Live, is assisting in reaching this goal. Expo Live fulfils a promise made during the bid phase to support businesses and innovators by serving as an incubator for new models and new ideas. It supports any innovative solution with a social or environmental impact, or both.

Expo Live's four programmes have a total allocation of USD 100 million to back projects, as well as provide business guidance, technical assistance, promotion

Bird's eye view
rendering of
Expo 2020 Dubai



© EXPO 2020 DUBAI



Graduation ceremony
of Expo 2020 Dubai's
Apprenticeship
Programme

and connections, and the opportunity to potentially showcase the idea to the world at Expo 2020 Dubai. Through these programmes we aim to inspire and act as a catalyst for creative and scalable solutions.

The Expo Live Innovation Impact Grant Programme is open to anyone, anywhere, demonstrating how innovations coming from all places and people can advance the pace of progress and inspire a more inclusive and prosperous future. It is already supporting 45 projects in 30 countries to reach their potential, some of which could have a global impact.

Inspiring new stewards of our planet

Expo 2020 Dubai is the first World Expo to be held in the Middle East, Africa and South Asia, a region that boasts a substantial youth population, who possess an enormous wealth of potential. Expo 2020 is working to harness and nurture this talent, with the knowledge that our youth are the innovators and thought leaders of tomorrow and have a central role to play in creating a better future, not least as the new stewards of our planet.

Through inspiring, empowering and involving youth, Expo 2020 Dubai will help them take ownership of their own future. By engaging all youth living in the UAE, from school students to post-education adults, we aim to ensure young people experience meaningful participation in the planning of and during Expo 2020.

Through our Youth Connect programme, we have already reached more than 20,000 students via roadshows to schools across the UAE, Youth Labs, site tours by international delegations of students and involvement in external events. The roadshows raise awareness about the Expo, inspire students and encourage them to take a leading role in a shared journey to 2020 and beyond, while Youth Labs are a platform for young people to shape and define elements of Expo 2020 Dubai and take ownership of it.

Expo 2020 is also creating special experiences for young people by young people, through designing immersive and interactive exhibits that inspire, excite and engage youth. We will make Expo 2020 Dubai an ideal place for exploration and discovery for young visitors, including exciting programming and events that light up their imaginations and spirit of innovation. Successful youth engagement is critical in creating a meaningful social legacy for Expo 2020 Dubai.

We are also giving youth work experiences through the Apprenticeship Programme, Expo Live and our Volunteering Programme.

The Expo 2020 Dubai Apprenticeship Programme is helping competent and highly skilled young professionals broaden their skills and experience for the eventual benefit of the UAE. About 80% of apprentices continued at Expo 2020 Dubai as full-time

employees from the first round of the programme. Twenty-six graduates took part in the first round of this nine-month training course. This opportunity has now been integrated into an existing scheme for Emirati graduates run by the Jebel Ali Free Zone (Jafza).

Expo Live has also extended its initial strategy to recently launch a team-orientated University Innovation Programme after recognising that about one-quarter of applications to the flagship Innovation Impact Grant Programme were from universities, even though they were not directly targeted. The programme seeks to intrigue and empower UAE university students to look at global problems worth solving and connect minds with their peers to come up with a solution. Shortlisted candidates will go through a design thinking workshop that will empower them to improve and develop their ideas further, in preparation for a live pitch. Expo Live will also support some innovations to be taken to prototype stage and even be showcased at Expo 2020.

Additionally, in October, Expo Live launched its Innovation Challenge Programme, calling on all people in the UAE to present their ideas for making life better. This could include, for example, an innovative project to cut unnecessary food or water waste, or which makes improvements to road safety.

More than 30,000 volunteers of all ages, nationalities and backgrounds will be the face of Expo 2020. We have created strategic roles to ensure volunteers gain the most out of their experience, including skills that they can go on to use in the workplace or in their daily lives, and unrivalled exposure as they help to put on one of the world's largest events.

During the Expo, there will be more than 45 volunteering roles, from welcoming guests and guiding them around the Expo districts to managing events, with more than 16 million volunteering hours across 173 days. Registration opened in October, giving volunteers the opportunity to be involved in the journey leading up to as well as during the Expo.

Setting the stage for a global transformation

Expo 2020 will not just be an event, it will be a platform from which an enduring legacy unfolds – and is already unfolding. It will help initiate and facilitate dialogue on the challenges of better stewardship of our world by offering a unique global platform for ‘connecting minds’.

The collaboration between youth, families, nations, businesses and other organisations to co-create this mega-project will boost our learning and our outcomes as we strive to solve common challenges and inspire a new narrative for sustainability. It is a recipe to identify great ideas, no matter how small or big, from all sources around the world and to provide a platform for those ideas to be exposed and shared, regardless of finances, geographical location or an individual's single skill set. Put simply, to ensure no potential solution slips through the net.

We are at a crossroads in determining how our planet, and our population, builds resilience. Expo 2020 Dubai is set to leave a profound footprint on this journey.

Expo 2020 will not just be an event, it will be a platform from which an enduring legacy unfolds



From Expo 2010 Shanghai to World Cities Day

Dr. Cheng Jian



Currently, more than 50% of the global population dwell in cities and nearly 60%, that is, about five billion people, will live in urban areas by 2030. On the one hand, cities, which boast highly developed commerce, cultures, technologies, productive forces and social welfare, are able to offer their citizens extremely abundant materials and spiritual wealth; on the other hand, they are facing unprecedented challenges. For example, although all the urban areas worldwide only take up 2% of the total land area on earth, people living in cities account for 60-80% and 75% of energy consumption and carbon dioxide emissions of the world respectively. Meanwhile, rapid urbanisation also leads to problems such as population explosions, traffic jams, inadequate housing, environmental pollution, resource shortages, a heightened gap between the wealthy and the poor and cultural conflict etc. So, how to achieve a sustainable urban development is the most urgent challenge the whole world faces in the 21st century.

Everything starts with World Expo

Facing the challenge of how to realise sustainable urban development, the international community has gathered many times to seek feasible solutions, including the grand opening of World Expo 2010 on 30 April 2010, along the banks of the Huangpu River in Shanghai, China. This was the first time for a World Expo theme to focus on quality of life in cities, which gave the international community the opportunity to share achievements and offer a comprehensive overview of the theme of “Better City, Better Life”. In those 184 unforgettable days, as many as 246 countries and

View of part of the
Europe Zone at
Expo 2010 Shanghai



international organisations showcased their ambitious plans and creative ideas, allowing us to see the latest concepts concerning urban development in a pleasant and enjoyable way. We were also able to share the wonderful expectations held by people from all over the world for future city life.

Expo 2010 Shanghai was the first World Expo to be held in China, and set the record in terms of visitor numbers, with 73,090,000 visitors. During the six months in which it was open, there were 17,000 cultural and artistic activities presented, including dozens of international forums, the launch of a summit forum and six themed forums. Other records from this Expo include a 5.28 km² large area of parkland and a total of 42 self-built national pavilions. Expo 2010 Shanghai stressed that creative power would be key to future urban development, which revealed the general trend of modern cities and left the international communities with precious spiritual wealth such as pursuing progress, innovation, mutual opening, co-prosperity and harmonious co-existence. There is no doubt that this Expo made a significant and unique contribution to the advancement of human civilisation and the sustainable development of cities.

The “successful, wonderful and unforgettable” Expo 2010 Shanghai would be remembered not only by the hardware facilities like the spectacular “Four Pavilions along the Central Axis” and the magnificent Shanghai World Expo Museum, but also by its spiritual wealth, such as the “Shanghai Declaration”, the “Shanghai Manual: A Guide for Sustainable Urban Development of the 21st Century” and “Expo 2010 Shanghai Annals”, among which the application and establishment of World Cities Day was one of the most dazzling and brightest pearls.

*People living in cities account
for 75% of global carbon dioxide
emissions*

To establish World Cities Day: a solemn commitment made by Expo 2010 Shanghai

31 October 2010 witnessed both the closing of Expo 2010 Shanghai and the opening of the Summit Forum, jointly launched by the United Nations, the Bureau International des Expositions (BIE) and the Shanghai Expo Organising Committee. During the closing ceremony of the Summit Forum, Yang Xiong, the then Vice Mayor of Shanghai and the Executive Deputy Director of Shanghai Expo Executive Committee, on behalf of all the Expo exhibitors and participants from all over the world, read out the concise yet meaningful Shanghai Declaration, which contained only 23 sentences of 1,600 Chinese characters. However, it took three years for the drafting group to create, and therefore its significance was implied. At its very beginning, the Shanghai Declaration states:

“At present, with more than half of humankind living in cities, our planet has entered the urban age. Rapid urbanisation and industrialisation have offered to humanity the abundant fruits of modern civilisation, but at the same time they have brought unprecedented challenge. Population explosion, traffic congestion, environmental pollution, resources shortages, urban poverty

and cultural conflicts are becoming urban problems with a global scope. For historical and current reasons, these phenomena are especially prominent in many developing countries.”

The Declaration points out that it is necessary to reconsider the relationship between people, cities and the Earth in the process of urbanisation. It also advocates that we should create an ecological civilisation for the future, pursue a comprehensive and balanced growth mode, stick to technology-based development, build an intelligent and convenient information society, cultivate an open and sharing diversified culture, establish friendly and amicable living communities and embrace a harmonious and mutually supportive urban-rural relationship.

Finally, the Declaration ends with two appeals, one of which is to comprehensively summarise the ideological achievements of the Expo, its forums and the best practice areas, and to collect the valuable experiences of different cities all over the world and the common wisdom of human beings obtained in cities’ development so as to communicate them with the public, have them popularised worldwide and then provide urban managers with construction and management experiences.

Pudong side of
Expo 2010 Shanghai
site, Master Plan



The other of which is to set 31 October, the day when Expo 2010 Shanghai closed, as World Cities Day, so that the concepts and practices of the Expo can be passed down forever, to encourage an unremitting endeavour and pursuit for urban innovation and harmonious development!

Delegates of the Forum expressed their support with warm applause for this international document which contained the “greatest common denominator” because they were aware that the Shanghai Declaration had covered the ideological achievements of various kinds of exhibits, activities and forums at the Expo and encapsulated the Expo theme “Better City, Better Life”. Furthermore, it had come up with the innovation concept of “harmonious cities development” to solve the common problems we are facing today, discovered new space for the United Nations to implement sustainable development and offered a referential perspective for the sustainable urban development of cities in China and other countries worldwide, as well as for the New Millennium Development Goals of the UN and the 3rd UN Conference on Housing and Urban Sustainable Development (hereinafter referred to as the HABITAT III conference). There is no doubt that the Declaration was the most significant ideological outcome of Expo 2010 Shanghai and serves as a milestone for sustainable urban development. The two appeals in the conclusion of the Declaration say even more for the Chinese Government; for one thing, it could be deemed as a great opportunity to pass on the spiritual legacies of Expo 2010 Shanghai, and for another, it set a solid foundation for the application and establishment of World Cities Day.

The establishment of World Cities Day became the consensus within the international community

The application and establishment of World Cities Day was, on the one hand, to honour the solemn commitment made together by the Shanghai Expo Organising Committee, the UN and the BIE, and on the other hand, an effective follow-up of the outcomes of Expo 2010 Shanghai. The proposal to establish World Cities Day was in line with the trend of global urbanisation and was consistent with the tenets and goals that the United Nations, the Bureau International des Expositions (BIE) and the United Nations Human Settlements Programme were striving to achieve. Ever since its foundation, the United Nations has dedicated itself to “make a better world for human race”. World Cities Day and sustainable urban development are not only in conformity with the development targets of all countries in the world, but also represent the specific needs of both human beings and urban development. Besides, World Cities Day has by no means become a threat to existing international days. By the end of 2013, there were a total of 112 international days which had been approved by the UN. Those concerning urban development issues include the World Telecommunications Day, the World Day for Cultural Diversity for Dialogue and Development, the World Environment Day, the World HABITAT Day, the International Day for the Eradication of Poverty and the World Science Day for Peace and Development. They focus on current urban difficulties and challenges

The Shanghai Declaration was the most significant ideological outcome of Expo 2010

from different perspectives, however, no international day concerning the comprehensive development of cities had yet been set. So, the establishment of World Cities Day did not come into conflict with existing international days but completed the family of international days approved by the United Nations.

Ever since the establishment of the Bureau International des Expositions (BIE), it has aimed to promote exchange and find economic, cultural, scientific and technological solutions to global challenges facing humanity by overseeing and regulating World Expos. Almost all modern Expo organisers have focused their attentions on issues like the sustainable development of urban technology, culture and environment. Organised under the theme “Better City, Better Life”, Expo 2010 Shanghai aimed to make its own explorations and breakthroughs about major issues such as urban construction, management and development. After taking part in the application and establishment of World Cities Day, the Bureau International des Expositions’ (BIE) influence was further enhanced.

Two of the main responsibilities of the UN Human Settlements Programme since its foundation include improving the living conditions of the poor and promoting the sustainable development of cities. This could be better fulfilled with the approval and establishment of World Cities Day. At the same time, this has its own focus and makes it possible for the UN Human Settlements Programme to set up a global high-level negotiation mechanism for coping with problems concerning sustainable development so as to integrate various kinds of relevant resources and put them into better use, and to widen its influence among international communities.

Under these circumstances, it was the right time to file the application for establishing World Cities Day to the United Nations. Because of its major significance and far-reaching influence, the application and establishment of World Cities Day was strongly supported by many international communities including the UN and the Bureau International des Expositions (BIE).

The application “trilogy” came to an end, while Shanghai World Expo never says goodbye

The Secretariat of the Bureau International des Expositions (BIE), under whose auspices Expo 2010 was organised, spoke highly of and gave great support to the application and establishment of World Cities Day. During his many visits to Shanghai, Mr. Vicente G. Loscertales, the Secretary General of the BIE, met with members of the working group to follow up the latest progress and deliver his own advice and suggestions. In April 2012, the CCPIT (China Council for the Promotion of International Trade) sent an official letter to the BIE, where it suggested that the application and establishment of World Cities Day should be included into the agenda of the Executive Committee Conference in Paris on 24 April. Later, in June 2012, during the 151st General Assembly of the BIE, with the support of Mr. Loscertales, the proposal of filing World Cities Day to the United Nations was passed unanimously by delegates and the 31 October was voted to be World Cities Day.

*Interdependence among
countries deepens day by day*



Expo Axis and China Pavilion, Expo 2010 Shanghai

In April 2013, when the 24th Board Meeting of the Human Settlements Programme started in Nairobi, the Chinese delegation attended and tried their best to make the significance of World Cities Day well understood. On 19 April, when the Plenary Meeting was held by the Human Settlements Programme, 16 countries including China, Russia, Nigeria, Kenya, Sri Lanka and Morocco proposed the adoption of the resolution to establish World Cities Day during the 68th General Assembly of the United Nations. At last, when the President of the Assembly announced the final approval of resolutions including World Cities Day, all the participants cheered with enthusiastic applause.

On 24 July 2013, the United Nations Economic and Social Council, after discussion, decided to approve all the resolutions put forward by the 24th Board Meeting of the Human Settlements Programme, including the establishment of World Cities Day. On 6 December 2013, the Second Committee Meeting of the 68th Session of the United Nations Assembly was launched in the UN headquarters, during which the resolution concerning human settlements was passed and 31 October was assigned to be World Cities Day, starting in 2014. This was the very first time that China initiated an international day with the support of all UN Member States.

Over the past years, joint efforts from various parties, including the Chinese government, have been dedicated to the establishment of World Cities Day. From the application to its final approval, it was approved by the BIE General Assembly, the UN Human Settlement Programme Council, the UN Economic and Social Council, and the UN General Assembly. It is absolutely positive that World Cities Day draws more the attention of the international community to the progress of global urbanisation, and brings all the countries together to share opportunities and cope with challenges rising from urbanisation and achieve sustainable development of cities and the world as a whole.

Great significance of World Cities Day

As an International Day approved by the United Nations, World Cities Day derives from the spiritual legacy of Expo 2010 Shanghai and shares the theme of 'Better City, Better Life'. Emerging from the requirements of our era, the day is of great importance to the sustainable development of the whole human race.

In the resolution passed by the 68th United Nations General Assembly concerning World Cities Day, it reads that from 2014, the 31 October will be assigned to be World Cities Day. It stipulates that countries, the UN system (especially the Human Settlement Programme), relevant international organisations, civil society and all other relevant stakeholders are invited to celebrate this day, via all kinds of activities so as to raise more attention. It also stresses that the expenditures of the celebration activities should be collected by voluntary donations and that these activities require effective organisation. The day serves as a platform through which problems arising from urbanisation worldwide, those affecting the developing countries in particular, can be solved by transnational cooperation. World Cities Day aims to draw people's attention to problems of various fields the world is facing in the process of global urbanisation, including problems in urban economy, urban culture, urban planning, urban environment, urban management, urban technology and informatisation and so on through themed activities, forums, award presentations, training and achievement sharing. This will allow the governments concerned, especially governments of developing countries, and society as a whole to actively take advantage of these great opportunities and come up with corresponding solutions to cope with these challenges via effective urban management.

World Cities Day has a positive influence on the international community because it serves as an annual reminder for governments to focus on the major problems and challenges rising from urbanisation, and is able to increase the role of each individual, non-government associations and organisations. It also serves as an exchange and cooperation platform where the international community can integrate resources of diversified fields concerning urban problems and optimise their utilisation. Developing countries are able to have a deep discussion with developed countries about the key challenges they are about to face in a time of rapid urbanisation and learn from the experience of the latter. Developed countries can take this great opportunity to have their previous solutions practiced in developing countries so as to promote the sustainable development of all cities in the world and the whole human race.

At present, the world economy is struggling to bounce back, so interdependence among countries deepens day by day and the old regional restriction concerning market elements such as capital and talent is gradually being lifted, it is now possible for them to be exchanged freely among cities worldwide. At the same time, problems such as financial crises, climate change and cultural conflict are simultaneously cornering both the international community as a whole and each individual government. The coordination and solutions of many major economic, social and cultural issues require more specific cooperation among cities, instead of being confined to the national and regional levels, which challenges the traditional urban

management mechanism of developed countries as well as the current urbanisation mode of developing countries.

In order to answer these challenges in the urban age, governments and the international community have made active efforts and explorations. The practice has showed that no single city could pick itself out of this global urbanisation trend. Thus, World Cities Day rises to the occasion to serve as an international discussion platform where parties concerned are able to gather together to solve problems concerning the sustainable development of modern cities, to come up with a negotiation system for urbanisation problems, to draw more attention from governments to these major challenges and to discuss feasible solutions and then, to have them implemented worldwide.

The three pillars for sustainable development set out by the UN are economy, social development and environment protection, which are mutually dependent and key to the sustainable development of cities. They are of great influence on the future well-being of humankind, that is to say, the future of sustainable development worldwide has never been so closely tied to urban development as it is today. This explains why sustainable urbanisation has been listed as a high-priority item in the United Nations Sustainable Development 2030 Agenda and has been included in the United Nations New Urban Agenda as important content. World Cities Day aims to offer a platform for parties concerned to discuss urban sustainable development issues and to exchange urban management experiences so as to raise awareness of towards urban development and relevant problems arising from it, as well as to achieve sustainable development of the whole human race.



The future of sustainable development has never been so closely tied to urban development as it is today

The implementation and prospect of World Cities Day

Ever since the establishment of World Cities Day, explorations and attempts have been made to find the best mode for its operation. Currently, it is settled that the Chinese side and relevant departments under UN-HABITAT will come together on a regular basis to discuss and make decisions about major items such as the annual theme, the screening of manual examples and the host city. Meanwhile, a specialised agency in Shanghai makes an overall plan, integrates resources and takes charge of the implementation of specific activities.

According to the agreement reached between the Chinese side and UN-HABITAT, the Shanghai Coordination Center for the World Cities Day (hereinafter referred to

as the Cities Day Center) was set up in September 2014 as a public institution affiliated to Shanghai Municipal Commission of Housing and Urban-Rural Development. It is responsible for contacting UN-HABITAT, the Ministry of Housing and Urban-Rural Development of the People's Republic of China and other related departments in Shanghai, to plan, organise and participate in activities of host cities both at home and abroad and to finish various kinds of routine works.

Under the guidance of the Ministry of Housing and Urban-Rural Development of the People's Republic of China, the Shanghai Municipal Committee and the Shanghai Municipal People's Government, with the support from the International Publicity Office of Shanghai Municipal Committee, the Information Office and the Foreign Affairs Office of Shanghai Municipality, the Cities Day Center and UN-HABITAT have cooperated closely in accordance with the previous plan. They have launched a series of forums and themed activities in cities both at home and abroad including Milan (Italy), Quito (the Republic of Ecuador), Shanghai, and Xiamen (China). At the same time, the Cities Day Center has also participated in the 8th World Urban Forum and HABITAT III, has revised and issued the 2016 version of the Shanghai Manual: A Guide for Sustainable Urban Development of the 21st Century (hereinafter referred to as the Shanghai Manual), and has actively popularised and promoted World Cities Day both at home and abroad. It has received extensive compliments from the United Nations, the Bureau International des Expositions (BIE) and relevant international friendship cities. Besides, it has also been making great efforts in training urban management and construction talents for developing countries.

The training activities currently available in Shanghai include the African urban management training class run by the UN-HABITAT and Tongji University, the training course of the Shanghai Manual launched by the China Executive Leadership Academy in Pudong and the ministerial city planning and management training

class for developing countries initiated jointly by the Cities Day Center and Shanghai Business School.

Compiled jointly by the United Nations, the Bureau International des Expositions (BIE) and the Executive Committee of Expo 2010 Shanghai, the first edition of the Shanghai Manual was officially released in November 2011, which gave a positive impetus to the sustainable development of cities worldwide. In 2016, under the joint efforts of all parties, the second revised edition was successfully completed and later released by Shanghai and the UN Human Settlement Programme during the HABITAT III conference. It could be considered as one part of China's contribution to this



global event on urban sustainable development which occurs once every 20 years. Furthermore, the United Nations held a promotional meeting at its headquarters in New York to introduce this new edition of the Shanghai Manual as one of the achievements from the New Urban Agenda. The promotion was well received and therefore made World Cities Day more popular and influential.

In the meantime, since 2014, Shanghai has committed to promoting World Cities Day, which has helped raise more awareness and expand its influence both at home and abroad. To unite all forces, we could take advantage of more extensive publicity by inviting both domestically and internationally influential media to report on the series of related activities. To enhance interaction among parties concerned and diversify dissemination beyond traditional media, the internet has also been included as a new type of media to popularise and promote World Cities Day. Nevertheless, compared with other international days which have already been fully acknowledged worldwide, World Cities Day, a newly established international day, still has a long way to go in terms of widespread awareness and mobilisation. The Chinese side, the United Nations and the Bureau International des Expositions (BIE) will continue their unremitting efforts down this road.

From the very beginning of the application of World Cities Day to its establishment and implementation, the Bureau International des Expositions (BIE) entered into a long-term and stable cooperation relationship with the Chinese side and the United Nations. It has been playing the role as a constructive partner, including offering platforms through which works related to World Cities Day could be finished, participating in the compiling of the Shanghai Manual and related annual reports and providing exhibition and exchange platforms for promoting World Cities Day at Expo 2015 Milan and Expo 2017 Astana. Along the way, Mr. Loscertales and his team have been giving us warm and generous assistance and support.

Having been derived from Expo 2010 Shanghai, World Cities Day serves as a platform to bridge all the cities of the world together, in order to build a poetic habitat for everyone. The 1996 Istanbul Declaration appealed that “our cities must be able to provide human beings with a wonderful life characterised by dignity, health, security, happiness and positive expectations”, and some of these beautiful prospects have already been vividly presented and answered with feasible solutions during Expo 2010 Shanghai. We have faith that, with the establishment of World Cities Day, which stands as a milestone for urban sustainable development worldwide, and with the continuous interest and efforts the international community has been showing towards urban development issues, we are definitely about to embrace a brighter and more promising future for urban development!

*Having been derived from
Expo 2010 Shanghai, World
Cities Day serves as a platform
to bridge all the cities of the
world together*



The background of the cover is a photograph of the Torre de Cristal at Expo 2008 in Zaragoza, Spain. The tower is a tall, cylindrical structure with a dark, textured facade and a series of horizontal bands. It is illuminated from within, and its reflection is visible in the water below. The sky is a vibrant orange and yellow, suggesting a sunset or sunrise. In the foreground, there are some dark, curved structures that appear to be part of the Expo grounds.

Theme and Expos in the 21st Century: the legacy of Expo 2008 Zaragoza

H.E. Eduardo Lopez Busquets

I have been always fascinated by the story of Victor Lustig, a con man who sold the Eiffel Tower twice in 1925. On the first occasion, the scam succeeded. He managed to cheat at least one businessman. Lustig probably used two arguments. On one hand, the iconic buildings of Expos (in this case Expo 1889 Paris) were ephemeral. On the other hand, in 1925, some articles were written showing that maintenance was very expensive and the tower was becoming run down.

Indeed, in 1903 a committee was established to advise on the demolition of the tower. Fortunately, in the spring of 1906, the contract was expanded until 1915. Finally, some two decades later, survival was granted for the Eiffel Tower to become “the most celebrated and instantly recognisable structure in the world, as well as the ubiquitous and indisputable symbol of Paris and French Culture”, in the words of Jill Jones.

Today, when we see the international projection of the Eiffel Tower and its extraordinary ability of generating income, we can realise the permanent imprint of the ephemeral.

In this article, I will focus on the thematic (both political and intellectual) imprint of the Zaragoza’s Expo 2008, whose theme was “Water and Sustainable Development.” This Expo was doubtless the first great international event to underline the need for humanity to articulate proper solutions to the challenges generated by water management, to prevent conflicts linked to water progressive scarcity, to fix the negative impact of climate change and to address the environmental, developmental and technological dimensions of water and sustainable development. Almost six million people attended Expo 2008 Zaragoza.

One hundred and four countries, plus three international organisations, participated in the Expo. It was indeed both the outcome of much social, intellectual, political, economic dialogue and research, trying to find a venue, and a platform to find solutions and establish lines of work and thinking for, at least, a generation. As a result, Expo 2008 became the largest and longest ever international event to take water as its central topic for discussion.

A thematic journey

Each Expo is organised around a central theme that defines the exhibition content of participants and the overall visitor experience.

To underline how important an Expo theme is in the 21st century, let me quote Vicente G. Loscertales, Secretary General of the BIE, who outlined in 2009 the evolution of the focus of the different Expos since the Great Exhibition of London in 1851:

“Expos are products of their time. Expos are, in fact, the physical expression of the cultural geography and the innovative capacity of the world at a certain time. [...] Between 1851 and 1940, Expos were strongly influenced by material

progress and technological inventions. [...] The years between 1958 and 2000 were characterised by the need to put technological innovation at the service of the well-being of humanity. [...] The new century is one of interdependence. Expos reflect the growing awareness that each action has long-term consequences on the environment and on our lives. Parallel to the renewed interest in Expos, there is also a new conviction that Expos can be, again, real instruments of progress in all of the areas that present problems today for the sustainability of the global lifestyle: the environment, energy, health, education, and so on.”

“Whereas, throughout the decades, the focus of Expos has been different, one important concept remains: it is the concept of progress. Although many consider it an outdated mechanistic concept, for the BIE it expresses innovation and the continuity between Expos, where each one is a milestone towards the future and catalyst for development.”

Linked to this idea, Secretary General Loscertales stresses in another occasion that every single Expo receives the double commission of mobilising the world around it and defending the core values of all Expos.

Zaragoza's Expo was the first of a series of Expos whose themes were deeply interconnected. Expo 2008 in Zaragoza (Water and Sustainable Development), Expo 2010 Shanghai (Better City, Better Life), Expo 2012 Yeosu (The Living Ocean and Coast), Expo 2015 Milan (Feeding the Planet, Energy for Life) and most recently Expo 2017 Astana (Future Energy). This series of Expos connected water, climate change, food and

Expo 2008 became the largest and longest ever international event to take water as its central topic for discussion

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Thirst Plaza,
Expo 2008 Zaragoza



Left: Spain's pavilion,
Expo 2008 Zaragoza
Centre: Europe
Plaza at Expo 2008
Zaragoza
Right: The Bridge
Pavilion, designed
by Zaha Hadid, Expo
2008 Zaragoza

energy in such a way that the whole Expo concept and legacy resulted in the benefit of the whole population of the world. A new narrative emerged in Zaragoza that was further developed in numerous venues.

The Expo took place at a time when concern for the environment was growing across the world, and water was a key aspect of the overall narrative.

In a recent book, David Feldman captures the essence of the links between water, sustainable development, climate change, food and energy, in a way that was already shown to the public in general in Zaragoza:

“Globally the production of food and energy constitutes the largest uses of water and are closely intertwined. Their interconnections strongly influence the exercise of power and the processes of decision making for water.

Energy/water nexus issues revolve around development through electrification, protecting water quality while producing energy, achieving integrated management of water and power, and employing hydraulic techniques for oil and gas extraction.

An important narrative in the food aspect of this nexus is how climate change, population growth and food and energy demand are creating new challenges for managing all three resource sectors in a more integrated fashion.”

Expo 2008 was a simple, but well-articulated, way to show the above-mentioned nexus between water, climate change, food and energy. Addressing the nexus placed water management within the broader global discourse on sustainable human development.

A key issue that needed to be tackled was that of water shortages in the context of global population growth and rapid urbanisation. Seth M. Siegel, in a book published in 2017, follows also a line well established by Expo 2008 Zaragoza. For Siegel, when addressing the hydric stress suffered by an increasing share of the world's population, and the possible conflicts, both national and international, that this



stress can provoke, “each of these challenges: population growth, rising affluence, climate change, pollution of water sources, leaky infrastructure and others can be overcome. Focus, will, creativity, trained personnel, and money is required ...But these problems can be addressed and even solved.”

In the same vein, Benjamin R. Barber has stated, in order to underline the importance of local and regional authorities in the fight against climate change, that “the world is getting too hot. Science makes it clear that sustainability is both necessary and possible. Politics shows it is achievable. Cities are poised to make it happen which is what makes them so cool”.

Words that have been echoed recently, in a best seller, by Michael Bloomberg and Carl Pope. Already in 2008, the vision embedded in Zaragoza’s Expo was an optimistic one. Dialogue, cooperation and inclusiveness were key words to address the challenges linked to water management and sustainable development.

A venue for communication

The ambition of the Expo was a holistic one: to educate, to entertain, to train, to show the way, and, above all, to communicate. The whole Expo, as Expos are, was an instrument of communication. The site itself, as the venue for this large-scale exercise in communications, physically embodied the theme of Expo and its promotion of cooperation and education.

The Zaha Hadid bridge, the Water Tower, other iconic buildings, the national pavilions, the pavilions of the Spanish Autonomous communities, the thematic pavilions, among them the “Faro”, which was the link with the civic society, were powerful instruments for addressing, with a practical vision, the needs and challenges of humanity in the current century. This is not an easy task. At the end of the day, it

The ambition of the Expo was a holistic one: to educate, to entertain, to train, to show the way, and, above all, to communicate



Thirst Plaza,
Expo 2008 Zaragoza

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depends very much on the will, the skills and imagination of the participants, and on the influence of the BIE.

The connections between Expo structures and themes and communication are not completely new. Talking about medical aspects of World Fairs in the United States in the last quarter of the 19th Century, Julie K. Brown has underlined that the organisers, using innovative structures and elements, strove, on one hand, to visually demonstrate the advances in applied health and medical practice, and on the other hand, to overcome the myriad of health problems generated by large crowds on the Expo site which had to be solved structurally. Julie K. Brown quotes the early study by Maurice Neufeld of the 1893 Chicago Exposition, finding that the Expo site was “an artificial city with real problems.” This conceptualisation, linking Expo structures with the theme, has always been at the heart of Expos and continues to play a central role today.

In Zaragoza, the Organiser of Expo 2008 attained a high level of consistency between the theme, Water and Sustainable Development, and the architecture, leisure and communication dimensions of it. This was not only visible on the site, but also in the city itself.

As Javier Monclús indicated: “in 2008, the Spanish city hosted an International Expo dedicated to water and sustainability that changed the landscape of the city. Surrounded by rivers, the city has grown with its back to them. The Expo has opened up Zaragoza by creating metropolitan and other parks, green avenues and many leisure areas all around the riverbanks.” This is a very important part of the legacy of Expo 2008 Zaragoza.

A platform to promote ideas and global policies

In hosting Expo 2008, Zaragoza was the centre of global attention in the domains of water management and sustainable models for development. It achieved this through the sharing of ideas, the showcasing of innovations, and by gathering experts and leaders to discuss and exchange. Evidence of the thinking and convictions

of the time can be found within the content of the speeches made and by the discussions that arose from the Water Tribune, as well as the policy document that was born from it: the Zaragoza Charter.

Let me firstly focus on the speeches that were pronounced by representatives of participating countries and international organisations during the different National Days (by the Secretary General of United Nations, Ban Ki Moon, or Prince Naruhito of Japan, for instance, and many Presidents and Ministers) and those pronounced, on behalf of the Spanish Government, by Spanish Ministers or in most occasions, by the Commissioner, Ambassador Fernández-Castaño.

These speeches represented an immense public record of aspirations, assessments, and solutions. To formulate the response of the Spanish Government, a big effort was made, through Spanish Embassies, to identify the challenges, the policies and the best practices related to water and sustainable development in different countries. I had the honour of leading the first part of that effort. And I pay tribute to the astonishing ability of Ambassador Fernández-Castaño to write one hundred and ten speeches, all of them masterpieces of synthesis and intellectual and practical determination.

Let me now shift the focus to the Thematic Weeks at Expo 2008 Zaragoza.

Expo 2008 was the first of a series of Expos that established links, materially and intellectually, between water and sustainable development, cities, food and energy

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Interior of the Bridge Pavilion, Expo 2008 Zaragoza

The city of Zaragoza has today become active in the research on water sustainability on a local and international level

The technical and scientific focal point of Expo 2008 Zaragoza was the Water Tribune, an intellectual instrument, practically oriented, enabling participants to debate, exchange experiences and opinions, and to propose solutions in the area of water management and sustainable development.

More than 320 thematic sessions were held, with 3,200 participants from 111 countries and representing multilateral agencies such as the European Union, the World Bank, intergovernmental and non-governmental organisations, with a wide number of fields and sectors in attendance. They gave voice to a wide-ranging group of water stakeholders: politicians, diplomats, business executives and economists, scientists, philosophers, journalists, artists and the general public.

Among the issues addressed for the first time in a great international event, we find desalination, the recycling of water, and the rational use of new sources of water, the modernisation of irrigation processes, the enhancing of public health, the coordinated management of water in river basins, the economy of finance of water, accommodation and mitigation of climate change, and the use of sources of renewable and sustainable energy. All of these issues are nowadays the subject of research with the aim of finding practical solutions.

A series of proposals and solutions were born to enhance the planet, water and the environment. They resulted in the creation of the Zaragoza Charter on Water and Sustainable Development that set guidelines for countries and citizens to achieve water sustainability.

Expo 2008 Zaragoza was instrumental in providing, as I have already mentioned, both a venue and a platform, to set standards and road maps, to look ahead and to contribute to identifying a lot of challenges and solve many problems. Let me show you some of the achievements that constitute its legacy:

1. Expo 2008 was the first of a series of Expos that established links, materially and intellectually, between water and sustainable development, cities, food and energy. Most of the issues addressed are now elements of reference for national and international policymaking and cooperation.
Against the backdrop of the water and sanitation crisis, the city of Zaragoza has today become active in the research on water sustainability on a local and international level.
2. At a local level, Zaragoza has done much to improve the city's water management and ecological footprint. Environmental policies, awareness campaigns, volunteer associations and improvements in infrastructures and public transportation have had a very positive impact.
3. The city of Zaragoza was home to the UN Water's "Water for life" Decade (2005-2015) to promote and encourage actions all over the world. In September 2015, the United Nations General Assembly finally agreed on a stand-alone water goal



Expo 2008 Zaragoza

(number 6), to “Ensure the availability and sustainable management of water and sanitation for all.” This reflects the key priority that water and sanitation have become for Member States. Goal 6 of the 2030 Agenda for Sustainable Development clearly links food security and climate change among other issues.

4. The Zaragoza Charter on Water and Sustainable Development contributed to the efforts deployed by Spain in its campaign for the consolidation of the human right to clean drinking water and sanitation, both fundamental rights set forth in the International Covenant on Economic, Social and Cultural Rights.

In December 2013, acting on a German-Spanish initiative, the UN General Assembly adopted a resolution in which the human right to clean drinking water and sanitation was explicitly recognised for the first time. Two years later, the right to drinking water and the right to sanitation were semantically separated in order to strengthen both.

The resolution calls on States to put in place appropriate frameworks, rules, investments or investment incentives to gradually improve the population’s water supply. The fulfilment of the right to clean drinking water means that every human being should have access to clean, affordable water of acceptable quality. Today, around 700 million people around the world have no access to clean drinking water, while 2.5 billion people have no sufficient sanitation. The resulting illnesses kill more children than diseases such as malaria, measles and HIV/AIDS combined. In view of the growing global population and increasing slum formation, the situation is likely to deteriorate.

The Spanish Government continues to promote the right to safe drinking water and the right to sanitation. If realised effectively, these rights in turn constitute a prerequisite for the realisation of other human rights, with such noteworthy examples as the right to health, to education, and to food.

5. Expo 2008 Zaragoza was also a major contribution to Spain's efforts in the realm of international cooperation. In the same spirit, we can highlight the Water and Sanitation Cooperation Fund (FCAS), a fund created at the end of 2007 by Spanish Cooperation, which ensures access to drinking water and sanitation in the poorest communities in Latin America and the Caribbean. The fund became active in October 2009.

The endowment of the FCAS currently totals 1.7 billion dollars (approximately 1.33 billion euros, of which donations from the Spanish Government account for 796 million euros).

The fund is the result of Spain's commitment to promoting access to drinking water and sanitation as a fundamental human right, and plays an important role in achieving the UN's development goals. FCAS supports the launching of water

and sanitation programmes and projects in partner countries in the region, prioritising the poorest countries and the most vulnerable communities. The fund is mainly used to provide the infrastructure needed to guarantee access to water and sanitation in communities that lack this service, to support the creation of efficient, transparent and participatory public management systems for these services and to strengthen institutions and public agencies in recipient countries in order to foster the design and implementation of comprehensive policies that ensure the sustainability of water resources.

The fund is managed by the Spanish Agency for International Development Cooperation (AECID), which had already supported Expo 2008 Zaragoza via international development cooperation programmes.

6. For the first time in Expo history, a See Agreement was signed between the BIE and the host country, Spain. This binding agreement regulated the framework of privileges and advantages to be given to the Official Participants in Expo 2008 Zaragoza. Beyond the practical advantages for solving organisational problems, what is of utmost importance is the fact that Spain, and all other countries that sign it, attach an extraordinary relevance to BIE as the powerhouse behind Expos.

As with all international exhibitions, Zaragoza's Expo 2008 was an ephemeral event, one that was a reflection of different visions of Water and Sustainable Development at a specific moment in time. This ephemeral nature has not, however, limited the lasting imprint of the Expo in Zaragoza, in Spain and across the world. Its impact is permanent and manifold, its ideas, inspirations and innovations continuing to shape the global debate and evolve alongside the priorities of today.

The Expo's thematic legacy is found in the ongoing discourse surrounding

The Expo remains alive in the memories and experiences of all those who created it, participated in it, and visited it

water management and climate change, and in the multitude of efforts being made to increase access to clean water and sanitation. In concrete terms, the Zaragoza Charter codifies the Expo's thematic legacy, but it is only a snapshot of the Expo's wider reach. The momentum created by Expo 2008 led to water being taken seriously as a fundamental human right and to a reinforcement of Spain's international development priorities in favour of water and sanitation access as the gateway to human development.

Within the context of the BIE, Expo 2008 Zaragoza was the first truly "Specialised" Expo, and it led the way for successive Expos to directly address global challenges through themes that aim to improve the condition of all humanity with an overarching focus on preserving the planet for future generations. The specific challenge of Water and Sustainable Development has been addressed at all these Expos, reflecting the continuing relevance of the theme since Expo 2008.

The Expo remains alive in the memories and experiences of all those who created it, participated in it, and visited it. Above all else, the Expo's legacy is that of a key moment where the attention of the world was focused on the precise challenges surrounding our relationship with water and the planet we inhabit. This moment was shared by citizens, by policymakers and by experts from Spain and from further afield, gathered together to reflect, learn and work towards a better future for humanity.



Interior of the Torre del Agua, Expo 2008 Zaragoza



An aerial photograph of the Expo 2005 Aichi site. The image shows a large, modern architectural complex with a prominent circular building in the foreground. The site is surrounded by lush green trees and landscaped walkways. In the background, there are rolling hills and a body of water. The sky is clear and blue.

Expo 2005 Aichi:

**Its legacy and the
launch of the “global
citizens” movement
with the aim to build
a sustainable global
community**

Shohei Fukui

Just 12 years since the opening of the Expo 2005 Aichi (called Ai Chikyuu Haku or Love Earth Expo), and despite many uncertainties and anxieties arising from economic deflation and natural disasters, such as the Great Eastern Japan Quake and Tsunami in 2011, in the intervening years, Aichi Prefecture and Nagoya City, the two host communities of Expo 2005 Aichi, have still thrived and demonstrated outstanding vitality and vigour. This fact, I believe, derives from three great legacies of Expo 2005 Aichi.

The first legacy is its theme “Nature’s Wisdom”. Under this theme, Expo 2005 Aichi has introduced ambitious research, development, deployment and demonstration projects to create new environmental technologies and new social systems. Challenges included the adoption of new energies and a new high level road transportation system; dissemination of bioplastics and advanced urban greening technology in the society; the promotion of wood-using projects; the challenges and further development of Artificial Intelligence (AI) and Robotic technologies; and diffusion of broadcasting and communication technologies. All these new developments have firmly integrated into the joint activities of industries, government and academics of the Chubu Region, which include Aichi Prefecture and Nagoya City.

The second legacy is the vitalisation of citizens power, which was thought of as the third engine of human society after government power and cooperation power. Expo 2005 Aichi has given a solid and grand platform for nurturing the senses of global citizens, cultivating the variety of difference existences. Aichi Prefectural Government has taken a courageous course to build the Exchange Centre for Global Citizens at the Expo Memorial Park, the former site of Expo 2005 Aichi, as a project to signify the succession of its philosophy.

Over 30,000 citizen volunteers have provided human power to develop and establish a variety of citizens’ activities under new Park usage instruments, creating circular societies, while expanding the “Expo Eco Money” movement to develop the demonstration of the 3R (Reduce, Reuse, and Recycle) society.

The third legacy is the strengthened positioning of Aichi Prefecture and Nagoya City in the international community for cultural exchanges. In 2010, the strategic invitation of COP 10 of UN Biodiversity Convention was met with a great success as a project to succeed the philosophy of Expo 2005 Aichi. Another grand success, UNESCO’s World Conference on Education for Sustainable Development (ESD) has further strengthened the status of Aichi and Nagoya as international cultural ex-

change communities, while demonstrating the continuation of Expo 2005 Aichi. Moreover, both Aichi and Nagoya have been able to further develop their industry and tourism strategies as post-Expo tourism exchange projects, which have resulted in drastic expansion of their “omotenashi (hospitality)” activities as international MICE (Meeting, Incentive tours, Conference, and Exhibits) cities.

This article will highlight the internal processes of Expo 2005 Aichi, which assured the sustenance of vigour in Aichi and Nagoya for the future. In addition, it will discuss how

Expo 2005 Aichi has given a solid and grand platform for nurturing the senses of global citizens

inner mechanisms of Expo 2005 Aichi attracted many citizens and audiences, inspired them to become global citizens, and brought in environmental conservation entities from around the world. Several case studies will be discussed in regard to the practices adopted to hold Expo 2005 Aichi.

Strategic establishment of the Theme and Project Concept to power up the event

During the Bureau International des Expositions (BIE) General Assembly of 1997, Expo 2005 Aichi earned the right to hold an Expo in 2005 under the theme of “Nature’s Wisdom”. Later on, however, the construction of Expo site raised serious confrontations with local residents, environmental groups, and international environmental NGOs. The original site of the Expo was formally an area of extensive environmental damages sustained through deforestation and earth excavation for the regional chinaware industry since the Edo era (17th to 19th centuries). It had gone through a 100 year-long recovery process to regain the natural environment of Satoyama (village mountain). The issue was the original design to build an entirely new town on the Expo site, which was a rather outdated concept for an Expo.

Instead, the Organiser of Expo 2005 Aichi determined to rebuild and recreate the Expo plan that would be fitting as the first Specialised Expo of the 21st Century. It adopted the core decision of Bureau International des Expositions (BIE) in 1994, which reinforced the role of Expos as forums to improve human knowledge, mutual understanding and international cooperation, rather than as trade fairs or an exhibits of commercial products. Organisers aimed to incorporate the respect for nature and the environment, while creating high quality cultural and artistic stages and to have every participant express and demonstrate the theme, fully and independently, corresponding to the requests of a modern society.

The key for redesigning Expo 2005 Aichi was to convert the theme of “Nature’s Wisdom” into a visual concept, in order for the theme to be applicable to every facet of the Expo, from the site planning to the management plan. Another key was the

Global Loop



reestablishment of the project concept, so that the theme and the project concept acted as two wheels to drive the reorganisation of the overall plan. To visualise the “Nature’s Wisdom” theme, the Organiser redefined it as learning “from the wonderful system of, and the power of living organisms in, nature, and to present the experimental model of the 21st century society while determining the way of a new culture and civilisation where humans and nature can coexist”. Moreover, the Organiser determined the project concept as providing “a forum for various exchange activities where every entity of a global society participates, while promoting “grand global exchanges” to bring various knowledge and cultures concerning “Nature’s Wisdom””. In short, they decided to create and weave a new image of the Expo in every aspect of participation, location, exhibition, events and operation, with the theme “Nature’s Wisdom” as the vertical thread and the project concept “Grand Global Exchange” as the horizontal thread. The strategic association between the Theme and the Project Concept was symbolised in the global loop as hardware, and the participation of various citizens as software.

The Global Loop was a 2.6km long horizontal corridor for pedestrians to move around the Global Common, overlooking six official exhibition areas built on the hill with a height difference of 40m, and was built around the existing park for the youth. It was a great challenge to build an Expo site under the new concept, where the event could co-exist with the renovated natural environment of Satochi (village plane) and Satoyama (village mountain). Moreover, it was an even greater technological and systematic challenge to build a rich forest city at the post-Expo site, after the creation of the Expo site to co-exist with Satoyama where 20 million people visited over a six-month period to take part in various dialogue and exchanges in a safe and secure manner.

The Project Concept of “Grand Global Exchange or participation of various citizens” allowed the project to gain the true participation of citizens for the first time in the history of Expos, and to regard NGOs and citizens as the third participating entity following the first and second participating entity of governments and corporations. To attain not only the independent participation in exhibitions and participation in events by citizens but also the more active and dynamic participation of citizens in the operation of the Expo, volunteer societies, self-operated by citizens, were established. The association’s 30,000 registered members promoted the waste-sorting movement, operated Expo eco-tours, and promoted Expo Eco Money. Their

activities won praise and commendations such as the transformation “from the Expo of seeing to the Expo of participating”, and the challenge of creating an “Expo of global citizens, by global citizens and for global citizens.”

The merging of the “Nature’s Wisdom” theme and the Grand Global Exchanges project concept was actively adopted and positively used in every activity of Expo 2005 Aichi. Such merging power was especially evident in the demonstration project to introduce new advanced nature-coexistent environmental technologies to a new society through the cooperation of industries, governments and academics. Moreover, it was

It was determined that Expo 2005 Aichi should become an experimental platform to test social practices for building a sustainable society

evident in the realisation of various participatory activities of citizens, regarding citizens as the third engine following States and corporations. Typical examples of demonstration projects were the Global Loop and the Expansion of wood-use (Kizukai), and the 3R movement and deployment of Expo Eco Money activities. As the representatives of the latter participatory activities, the promotion of a village for global citizens and the strategic promotion of citizens' projects and volunteer centre, promotion of nature schools for forests and sato (village) and the establishment and promotion of an exchange centre for global citizens were all highly important. These activities were to succeed the philosophy of Expo 2005 Aichi.

Realising the strategic linkage between the hosting of International Advisory Committee and UN's Sustainable Activities

The Japan Association for Expo 2005 Aichi successfully maintained a close cooperative relationship with the Bureau International des Expositions (BIE) throughout the processes of reviewing and redesigning the Expo 2005 Aichi Plan. The Association established the International Advisory Committee chaired by Mr. Ole Philipson, the Honorary President of the Bureau International des Expositions (BIE), with committee members consisting of the President of the Canadian Museum of Nature, the President of World Nature Conservation Organisation, the Undersecretary General of United Nations, the Chairman of IME, as well as environmental and cultural experts from influential countries. The committee discussed the ways in which the theme of Expo 2005 Aichi could be deepened and disseminated, and held five meetings until the Expo year of 2005.

The timing of the first Committee meeting held in May 2002, as well as the Preparatory Meeting held in November 2001, coincided with the period of reviewing and rebuilding the Basic Plan and Basic Design of Expo 2005 Aichi. The meetings therefore provided an excellent forum for actively exchanging opinions on the “Role of International Expos in Today's World: critical assessment and constructive proposals” and the advisory to Expo Aichi. It was determined that Expo 2005 Aichi, as the first Specialised Expo of the 21st century, should become:

- An experimental platform to test social practices for building a sustainable society
- A place to practice the conservation and protection of diversities in regions, living organisms, and cultures
- A forum to nurture the senses of global citizens and share feelings of solidarity.

These powerful proposals gave strong tailwinds for the sailing of Expo 2005 Aichi to develop the overall plan with three key ideas of “sustainable society”, “protection of diversity” and “solidarity of global citizens.”

Furthermore, this International Advisory Committee provided insights into the ways Expo activities with other global environmental and international exchange activities of the United Nations and other international organisations can be associated and linked. It also became a bridge to connect human networks for the ESD (Education for Sustainable Development) Movement proposed by the Government of

The Aichi Targets were set to determine global common targets toward the coexistence of humans and nature

Japan and NGOs to the UN Johannesburg Summit. Especially notable was the recognition of Expo 2005 Aichi as the kick-off event of the UN's "Decade of ESD." Many Japanese NGO leaders participated in the above planning activities and became prominent members to promote Expo 2005 Aichi's "Village of Global Citizens" project as well as the "Nature School of Forests and Villages" and "Citizens Project." It was also notable that these organisations and their leaders became the leaders of ESD movement in Japan during the post-Expo 2005 Aichi period, empowering and expanding it into a huge powerful movement.

As a part of the activities to succeed the philosophy of Expo 2005 Aichi, the Government of Japan and Aichi Prefecture successfully invited the COP 10 of the UN Biodiversity Convention (in 2010), and UNESCO's World Conference on ESD (in 2014).

At the COP 10 held in October 2010, the parties to the Convention adopted the "Nagoya Protocol," which set international rules for access to, and the profit allocations of, genetic resources. The Aichi Targets were set to determine global common targets toward the coexistence of humans and nature, and the Aichi Nagoya Proclamation was put into place to help communities take action to conserve biodiversity. Needless to say, the Expo 2005 Aichi Memorial Park provided the subsidiary venues to hold citizens' programmes in cooperation with those who actively participated in Expo 2005 Aichi.

UNESCO's World Conference on ESD, held in November 2014, resulted in the adoption of the Aichi-Nagoya Declaration that declared every nation would need to promote ESD for global challenges including climate change, conservation of biodiversity and disaster prevention. At the same time, the conference established the "UNESCO Japan ESD Prize" to praise and recognise the entities that practiced excellence in ESD.

Case Study 1: Expanding Global Loop, Wood-use Movement

The late Shozaburo Kimura, the Overall Producer of Expo 2005 Aichi, talked about the Global Loop as:

"The horizontal corridor (Global Loop) can be called the biggest highlight of this Expo. Walking on the wooden floor of the Global Loop that extends 2.6km long surrounding the Expo site, we can overlook the Expo site and enjoy the changing scenes... the Global Loop provides the "enjoyment of changes as one moves," which is the unique feature of Japanese gardens that value the changing sceneries while walking around. On the Global Loop, you can feel a cool breeze from the surrounding woods, refreshing to your bodies and minds. Unlike Expos held on flat terrain, Expo 2005 Aichi provides the scenes of forest cities for people to enjoy living in the 21st century with health and safety and treasure co-existence with the Nature."

In fact, questionnaires from Expo attendants indicated that they overwhelmingly valued the most "the Expo site design of using natural topography such as Global Loop", and expressed that the place allowed them to feel close to the Expo's

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theme of “Nature’s Wisdom”. The Expo site of the Youth Park had a rugged terrain with hills of 100m to 140m above sea level, which was equal to the height of 10 story-high building. To overcome this problem of rugged terrain, the Global Loop, or horizontal corridor, used a hybrid system consisting of the most advanced iron rib structure and wooden floor system to have greater resistance to high winds and possible earthquakes. In consideration of co-existence with the Nature, the Global Loop used steel pipe piles with wings attached at the end for the foundation rather than the usual concrete piles.

The adoption of this Global Loop using wood in various ways had immediate ripple effects on the designs of various other features of Expo 2005 Aichi, and resulted in the wood-usage (Kizukuri) movement that would actively utilise wood and wooden products. The examples include the wooden truss structure bridge connecting the North Gate and East Gate, the outer walls of global common pavilions, and outer walls and interiors of the Expo hall and Expo dome. In particular, hosting organisations, such as the Government of Japan and Aichi Prefectural Government, actively utilised the advanced wooden construction methods for their pavilions. The survey conducted by the Aichi Prefecture confirmed that the overall amount of wood and wood products used for Expo 2005 Aichi was 8,630m³. This was the very reason why people appreciated “Expo 2005 Aichi being the wooden Expo.”

Since the closing of Expo 2005 Aichi, the Japanese way of using and conserving forestry reserves has become a model for others, developing many new and different ways to process and produce laminated wood. The number of permanent high-rises and large-scale public buildings built with wooden products has been on the increase. The most notable example is the new national stadium to be built as the main stadium for 2020 Tokyo Olympics and Paralympics. Another example was the Japanese Pavilion at Expo 2015 Milan, which utilised a three-dimensional wooden grid reflecting Japan’s 1,000 year old history and tradition as well as the wisdom of Buddhist temples’ construction. The producer and designer of the wooden structures at Expo 2005 Aichi was Professor Atsushi Kitagawara of Tokyo University of Art, who

Left: Wooden truss structure of North Entrance, Expo 2005 Aichi
Right: Japan Pavilion at Expo 2015 Milan using three-dimensional wooden grid



produced the outlook tower, called the Wooden Turret (14m high) as the main facility of Sato's Nature School of Satoyama Trail Zone. This certainly demonstrated how the wood-using movement of Expo 2005 Aichi became a sustainable movement to resolve global issues at Expos.

Case Study 2: *Bio-Lung and global diffusion of vertical greening technology*

The symbolic monument of Expo 2005 Aichi with the theme of “Nature’s Wisdom” was massive wall filled with flowers and plants – the Bio-Lung. Along with the nearby open-sky forests (Tenkuu-no-mori), the Bio-Lung, which consisted of massive vertical walls of two-rows and three-facets with a maximum height of 25m, a total length of 150m and area of 3500m², was literally the creation of life-sustaining equipment that can function as the third lung of humans living in cities. With pots of living plants and flowers placed vertically in multiple layers, the Bio-Lung allowed plants to continue dynamic photosynthesis. Combined with other high-level engineering technologies such as dry mist and an automatic sprinkler system, the Bio-Lung provided epoch-making vertical green wall that could create a micro-climate at the site, providing a lower ambient temperature, cleaner air and modifying the heat of an urban environment.

The project received significant support and promotional activities, not only from the ministries and agencies of the national government, but also from the cooperation of many leaders in gardening and landscaping academics and the Association for the Study of Sacred Forests, as well as experts and leaders of private corporations. It was literally the project of industrial-academic-government collaboration. The Bio-Lung project placed special emphasis on the dissemination and commercialisation of

Right: Bio-Lung
planned as the symbol
of Expo 2005 Aichi
Top left: Bio-Lung
Bottom left: Example
of the latest Bio-Lung
at Hachioji Fair 2017
for All Japan Urban
Greening



the vertical green wall in our society. The first state visitor to Expo 2005 Aichi, President Chirac of France, showed a special interest in this Bio-Lung project, and recommended its introduction into his national urban development project.

During Expo 2005 Aichi, the Organiser was able to accommodate the 24 periods of yearly seasonal changes in Japan, which was the operational theme of the Expo Plaza. At the Bio-Lung, the pots, set into 1.5m x 1.5m panel units, were filled with seasonal flowers and plants to show the dynamic changes in seasons from early spring, to spring, summer, and autumn.

After Expo 2005 Aichi, an increasing number of major cities in the world as well as in Japan started to introduce vertical green walls and urban greening technologies. In Japan, we were able to reduce the panel unit size to a hand-held cartridge, and to use dryness sensors to operate an automatic sprinkler system. Such efforts enabled great energy saving, size reducing, automated watering, and overall economising to allow greater dissemination of this new symbolic urban environmental device. Moreover, the Bio-Lung, or green wall, was developed into an epoch-making entertainment place in collaboration with the latest image screen devices.

Case Study 3: Deployment of “3R movement” and “Expo Eco Money”

Expo 2005 Aichi was a forum for demonstrating a model circular society and 3R practices through empirical experiments involving many citizens. Moreover, the Expo promoted the activities of Ms. Wangari Maathai, a Nobel Laureate, to introduce a global common term of “Mottainai (make no waste) spirit,” which was the traditional value shared in Japanese society, in addition to the respect for “3R”. Her Expo 2005 Aichi activities were a true driving force in expanding and extending the circle of empathy and support for Mottainai spirit.

The first effort was the strategic introduction of bioplastics. There were two types of bioplastics, i.e. biodegradable plastics that could degraded into water and carbon dioxide by microbe and biomass plastics that would be produced from recyclable organic resources such as plant materials. Expo 2005 Aichi developed and implemented two systems as forerunners of bioplastic labels. One was the green plastic identification labelling system for biodegradable plastics, mainly concerning food containers used in Expo 2005 Aichi restaurants and food courts. The another was the biomass plastics labelling system, which identified biomass plastics. Today, such bioplastic labels have been used for a wide range of products, including cosmetics, clothing, home appliances, automobile interiors, etc.

The second types of efforts were the waste sorting and waste reduction movement. The former was implemented throughout the Expo period as a major activity of the volunteer centre, raising awareness of waste problems among Expo audiences. The most typical waste reduction movement was “no more free shopping bags” activities in Nagoya City. The centre of the activities was the Council to Promote 3R of Containers and Packaging, which consisted of representatives from industries, academics, and citizens’ groups. The activities were to give out tradable points to citizens who would not use shopping bags. Even after the Expo, the same system has continued actively through the project to succeed the philosophy of Expo 2005 Aichi.



Left: The late Wangari Maathai, Nobel Peace Prize Laureate
Right: Waste sorting by volunteers at the Volunteer Centre



The third programme introduced at Expo 2005 Aichi was the “Expo Eco Money” movement, which was the environment-friendly currency system to gain Eco-Money points from environmental friendly activities, such as participation in environmental education programmes, participation in the no free shopping bag movement, and the use of public transportation. The points (or Eco Money) could be exchanged for eco products, or used as a donation for forestation activities. During Expo 2005 Aichi, about 600,000 people visited the Expo Eco Money Centre at the Expo site, which was four times more than the initial target, and in total 3.27 million points were earned. The Eco Design Forum for Civic Society, an NPO and the initiator and operator of Eco Money, has continued Eco Money activities in the local communities even after the closing of Expo 2005 Aichi. In Nagoya City and Toyota City, the Forum has actively worked on sustainable Eco Money activities to allow the use of Eco Money points to promote the installation of residential solar panels, to build or refurbish eco houses, and to disseminate and encourage the use of next generation eco cars, in addition to forestation and greening activities.

Case Study 4: Strategic promotion of “Global Citizens Village”, “Citizens Projects”, and “Citizens Volunteer Centre”

To resolve global environmental issues, such as global warming, it is important that everyone is able to think and act as a global citizen. As an Expo with the theme of “Nature’s Wisdom” and the project concept of “Grand Global Exchanges”, it was essential for Expo 2005 Aichi to actively promote the participation of citizens as mentioned before. In this sense, Expo 2000 Hannover’s creative way to achieve and promote citizens’ participation was greatly inspiring.

The Global Citizens Village attracted the participation of internationally acclaimed NPOs and NGOs, who initiated various dialogue and exchange opportunities with Expo audiences, based on the concept of learning sustainability as the global challenge of 21st century. The special feature of this programme was the self-deployment

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with the aim to build a sustainable global community**

and execution of monthly programmes with the themes such as “Nature and Environment”, “Human Rights Protection”, and “International Cooperation,” which were hosted by Japanese NPOs and NGOs (30 groups) in cooperation with domestic partners (15 organisations) as well as overseas NPOs and NGOs (48 organisations). To support such activities, an organisation was established in cooperation with major private corporations of Japan. Wangari Maathai praised the Global Village as one which embodied “the spirit of Expo 2005 Aichi” when she visited the Village one day after the opening of Expo 2005 Aichi. The Global (Citizens) Village also won the recognition as the international cooperation project of the “Decade of UN ESD”. Moreover, it provided the platform to demonstrate the solidarity of citizens and corporations in their efforts to create a sustainable society, while promoting cooperation among industries, governments, and academics in Japan’s ESD movement even after the closing of Expo 2005 Aichi.

Another citizens’ participation project was the citizens project set at the sub Expo site, which later allowed the renovation and recreation of the Expo site. The citizens’ project was a public invitation for citizens to participate in volunteer activities. Under the catchphrase of “Get together, people power”, the public were invited to participate in activities under five different themes of “Life,” “Neighbours”, “Environment”, “Time”, and “Beauty.” The Citizens Pavilion and the Circular Outdoor Stage provided functional space to support the exhibits, workshops, and dialogue. During the Expo, the dialogue stage displayed 120 programmes, the dialogue gallery 24 programmes, and the outdoor stage 47 citizens’ participation projects.

Although volunteer groups have conducted activities in support of any international and domestic exhibitions held in Japan, their work was mostly supplementary, controlled by the hosting organisations. At Expo 2005 Aichi, however, the Organiser formed the Expo Volunteer Centre as an independent entity outside of the Expo’s organisation, to encourage citizens to adopt independent and proactive participation. The centre developed well-coordinated and cooperative relationships with Expo organisations under the philosophy of “independency, autonomy, and continuation in regional communities”. After the Expo, the centre continued to maintain

**Left: The NGO Global village
Centre: Activities of citizens projects
Right: Activities of the self-operated Volunteer Centre**



the status of a specific non-profit entity, offered guided tours of the Expo 2005 Aichi Memorial Park, continued the operation of the Expo Eco Money Centre, and hosted various lectures, seminars, and forums under the concept of “realising citizen participation society”.

Case Study 5: Promoting “Nature School of Forests”, and “Nature School of Sato (village)”

The Nature School of Forests and the Nature School of Sato (village) were the projects organised and promoted as the theme projects of the Expo’s organisation, where participants were able to learn about and experience Expo 2005 Aichi’s theme, “Nature’s Wisdom”, making the best use of the rich and abundant nature of Satoyama (village mountains) and reforestation.

The Nature School of Forests, located in the forestry experience zone of the Main Expo site, offered participatory experience programmes under the theme of co-relationships among various forms of the nature’s blessings, such as “lights”, “water”, and “forests.” It became an essential place to learn about nature’s system and the connection between nature and people, through participatory experience programmes to feel nature through the five senses and imagination, and to encounter nature, people (as interpreter) and art (and beauty) in the forest.

The Nature School of Sato, set at Satoyama Trail Zone of the sub-Expo site, provided the forum to learn traditional wisdom and skills as well as the coexistence of environmental systems under the themes of “earth”, “Sasayama”, and “conservation.” The school became the learning experience place where participants could earnestly study the “Nature called Satoyama” and “the exchanges with Satoyama,” both practiced by Japanese people for a long time in its history, through experiencing the richness of Satoyama coexisting with people lives, as well as learning the significance of “earth” in Seto region acclaimed for sophisticated pottery arts. The declaration of the “Satoyama Initiative” during the CBD’s COP 10 held in 2010 signified the positive legacy of the Environmental Education Programme practiced during Expo 2005 Aichi.

Nature School of Forests and Nature School of Sato provided the opportunity and forum for educating true interpreters of nature with the participation of Japanese leaders in environmental education. Mr. Tadashi Kawashima, the overall producer of this project and the Chairman of the Japan Environmental Education Forum, described such interpreters as new environmental education activists who “can convey what cannot be seen through what can be seen.” One hundred members who attended these schools later became leading interpreters to teach and support the nationwide environmental education and powerful driving force to promote ESD efforts in Japan.

Both projects have continued to develop into a sustainable movement even after the Expo. Moreover, we must note that there has been other post Expo projects actively deployed and pursued, such as the Aichi Satoyama Laboratory to experience farming in Satoyama, and the Satsuki and Mei House project promoted as associated projects to attract the participation of many citizens.

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Activities of Nature Schools of Forests and Sato



Case study 6: Newly constructed “Exchange Centre for Global Citizens” and its promotion

Aichi Prefectural Government, the host community of Expo 2005 Aichi, established the Committee to Review the Succession of Expo 2005 Aichi Philosophies, after the closing of the Expo, chaired by the President of Nagoya University and which consisted of representatives from industry, government, and citizens. The Committee had comprehensive discussions on the review of the Expo’s outcome, and what should be continued and succeeded as the legacy of the Expo. As a result, the Committee unanimously proposed to build a Global Centre (Exchange Centre for Global Citizens) at the Youth Park of the Expo site to provide an aggregate site for various citizens’ activities which started at Expo 2005 Aichi, to make the movement succeed in the future.

In the past, many facilities built for Expos have become memorial facilities. The proposal to build the Global Centre, therefore, was entirely different as it would become a new futuristic forum of dialogue and exchange to sustain and support various citizens’ activities. The centre boasts an environmental friendly designed building and has the landscape to embody the Expo’s theme of “Nature’s Wisdom.” It has a rooftop garden incorporating the 2.6km memorial of the Global Loop, various conference rooms, and an all-weather event plaza. It provides an ideal place for the successor organisation of the Aichi Volunteer Centre and many other NPOs and NGOs to hold events and activities on continuous base, thereby enhancing its status as an urban park to promote ESD in Japan.

Newly built Global
Centre



In 2015, the 10th anniversary of Expo 2005 Aichi, the Expo 2005 Aichi Commemorative Park became the main venue of the National Urban Greenery Fair Aichi 2015, holding various programmes around the Global Centre, showcasing the latest projects in urban greenery technologies, and holding dialogue and exchanges with participants. Through such continuation of sustainable activities, we have been able to send out a powerful message to the world about the philosophy of Expo 2005 Aichi with its theme of “Nature’s Wisdom” and the project concept of “Grand Global Exchanges.”

Conclusion

This article discussed and illustrated how Expo 2005 Aichi attracted many citizens and general audiences and led them to become global citizens, while engaging them as major participants in the efforts of global environmental conservation. It also highlighted the internal mechanism of Expo 2005 Aichi that led to its success. The following summarises the major outstanding points of Expo 2005 Aichi’s success:

- Strategically applying the theme and project concept throughout every aspect of the Expo, including audiences, venues, exhibitions, events, management, etc. to realise the theme-oriented dynamism of Expos.
- For the sustainability of Expos, it is important to practice close and strategic co-operation with the Bureau International des Expositions (BIE), while deepening the cooperation and links between Bureau International des Expositions (BIE) and host countries to develop and advance themes and to create more preferable international trends.
- In addition to international organisations, states, and corporations, it is important to realise the serious involvement of various citizens. The changing trend

from the Expo of seeing to the Expo of participating is now evident among both developed and developing countries.

- Everyone must be aware of the legacy in holding Expos. It is extremely important to view an Expo not only as the world class event, but also as a not one-time only movement.
- The hosting national government must take the initiative, but it is also important to promote a cooperative system among industries, governments, academics and citizens. They must exert every effort to realise major transformation of the Expo from the event to showcase national pride and prestige to the event with Global Citizens as its main entity.

The Government of Japan has consigned the Global Industrial and Social Progress Research Institute (GISPRI) as the organisation to succeed and develop the philosophies of Expo 2005 Aichi. GISPRI continues to assess the outcome of Expo 2005 Aichi, and provides support for the activities and projects of industries, governments, academics and citizens to succeed and develop the philosophies of Expo 2005 Aichi. Ever since its consignment from the national government, the Institute has provided bold and ambitious support to various events, especially the Japanese Government’s exhibitions and citizens’ participation during the Expos held in Zaragoza, Shanghai, Yeosu, Milan, and Astana. It has been important for all host nations of these Expos to develop an organising system similar to that of Expo 2005 Aichi, and the Institute has offered support in that respect.

We believe that Expos should develop into “a forum to gather various entities of the world, while allowing them to pursue global challenges through a sustainable movement.” Furthermore, we believe that the mission of Expos is to make further progress in the “great and multi-faceted movement to resolve global challenges.”

Since the closing of Expo 2005 Aichi, the Japanese way of using and conserving forestry reserves has become a model for others



Global Centre in
Moricoro Park

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